



Science Example: Analyzing a Microlensing Event for Orbital Motion

Jennifer Yee

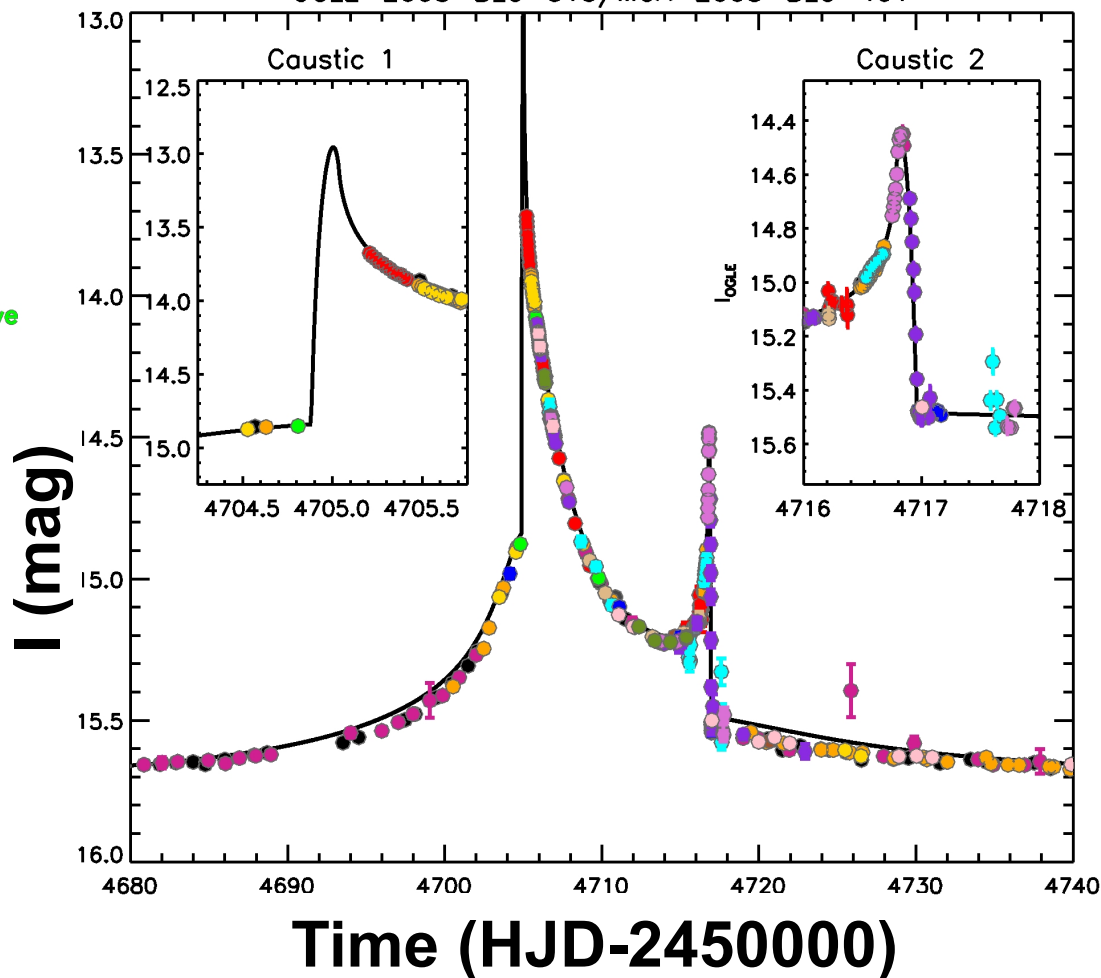
Ohio State University

in collaboration with

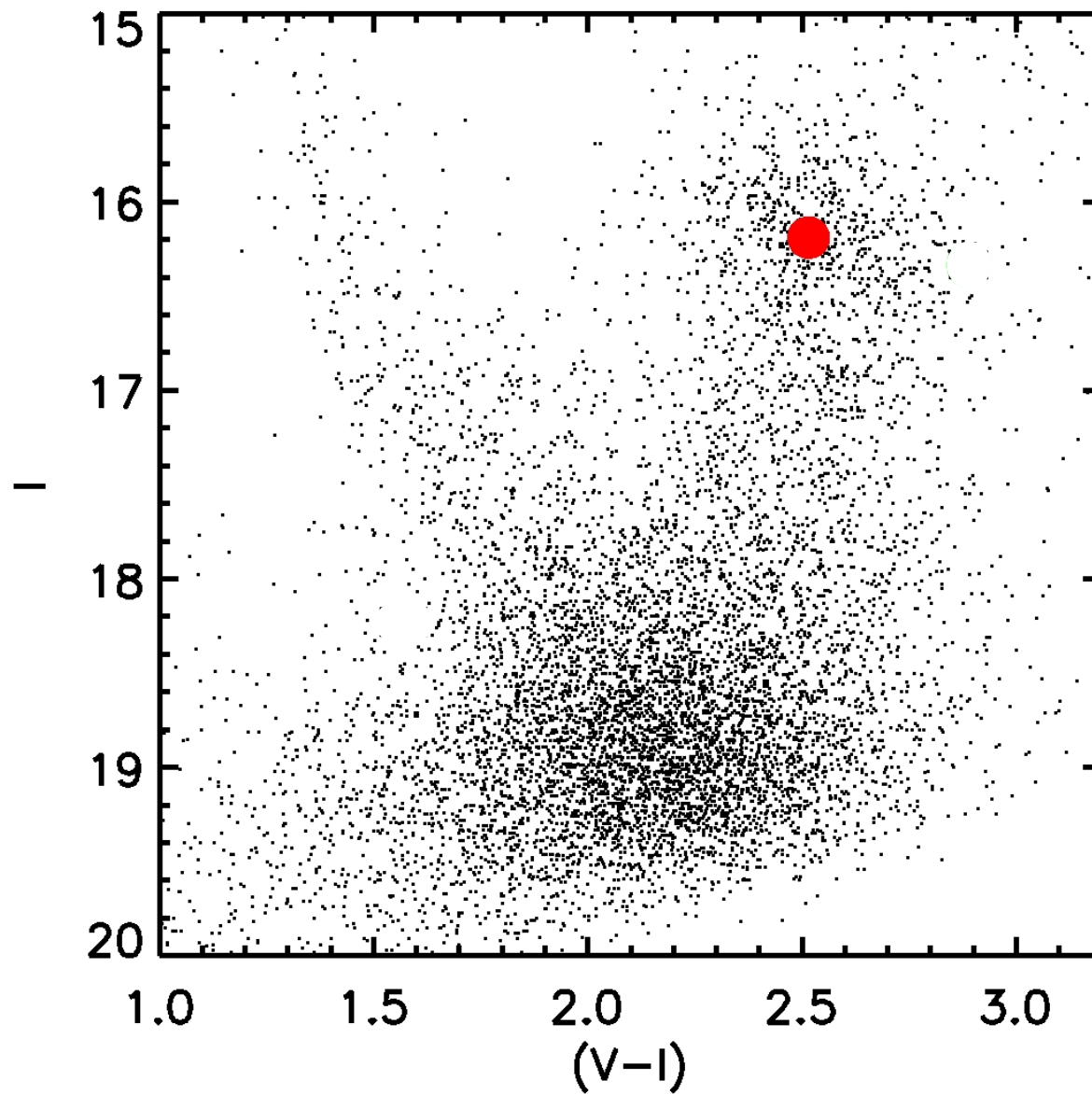
**OGLE, μ FUN, PLANET, RoboNet,
MOA, and MiNDSTEP**

OGLE-2008-BLG-513/MOA-2008-BLG-401

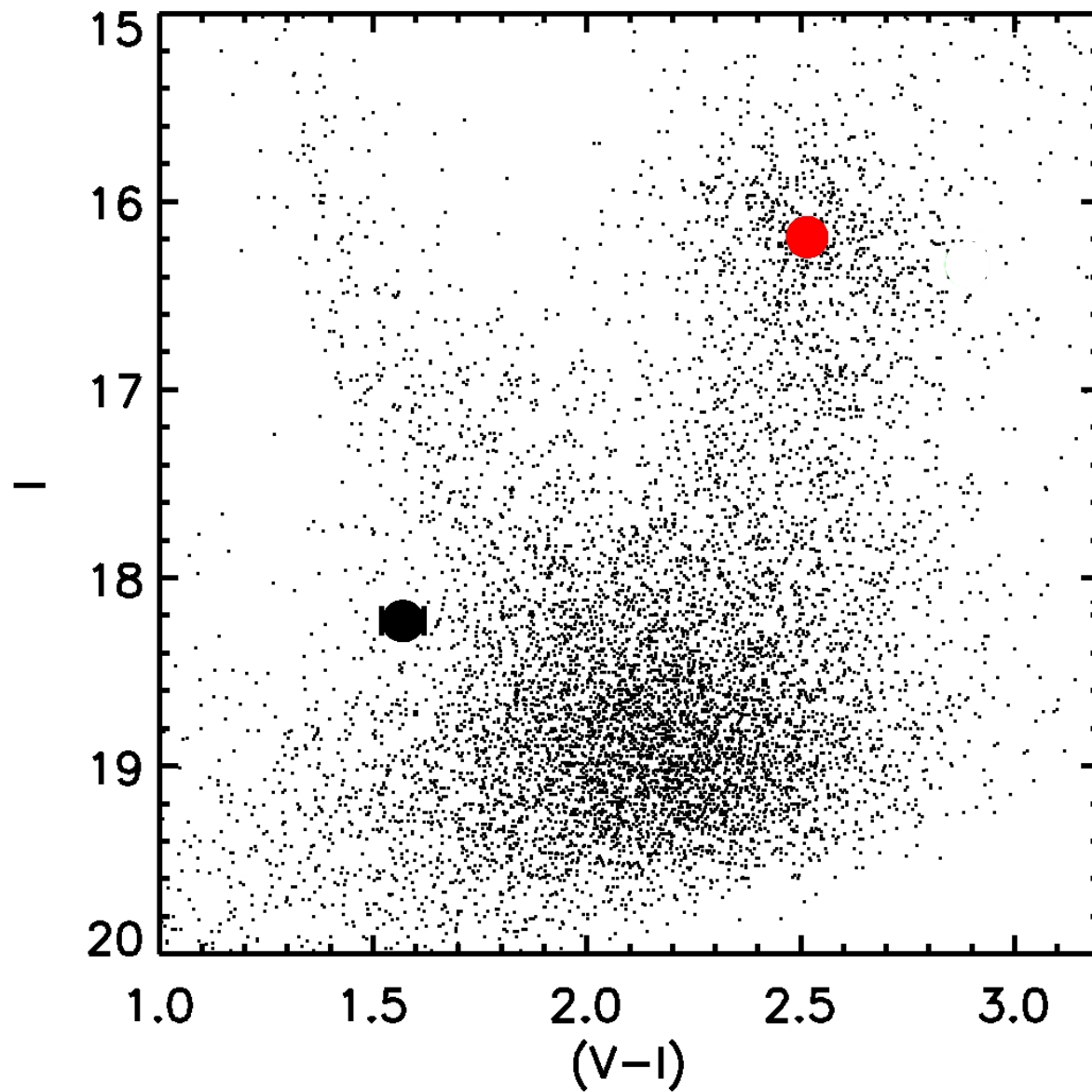
- OGLE
- MOA
- μ FUN Auckland
- μ FUN Bronberg
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- μ FUN CTIO V
- μ FUN Farm Cove
- μ FUN Kumeu
- μ FUN Palomar
- μ FUN Wise
- MiNDSTeP
- PLANET Perth
- PLANET Tas
- RoboNet FTN
- RoboNet FTS
- RoboNet LT



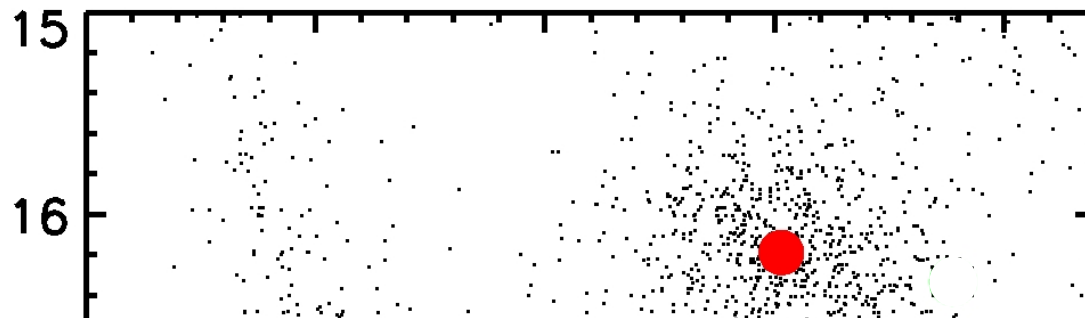
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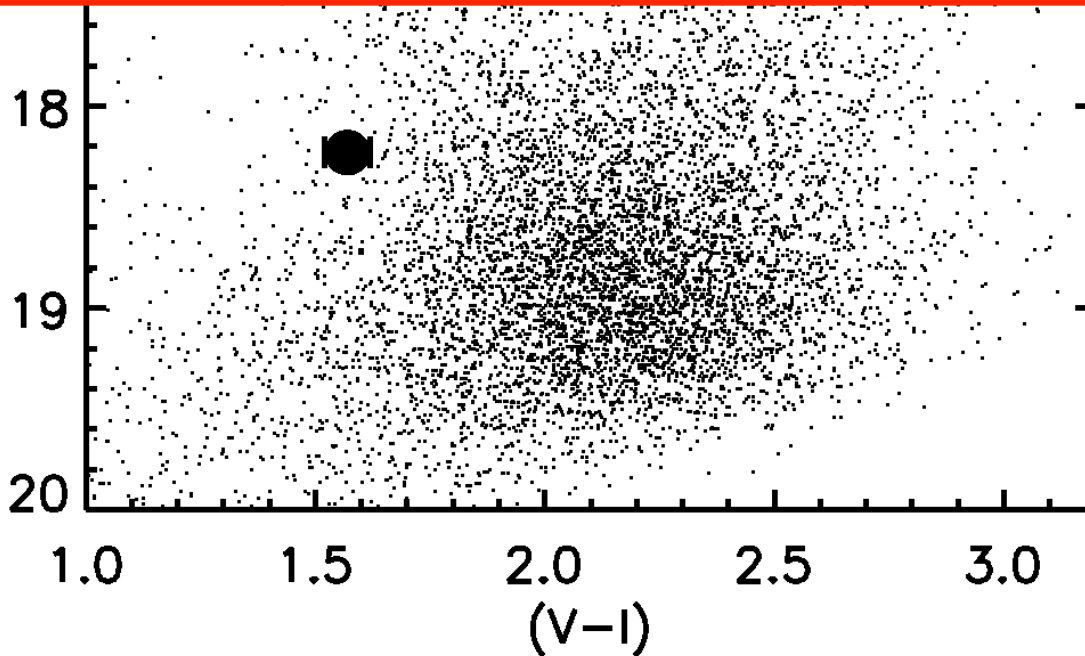
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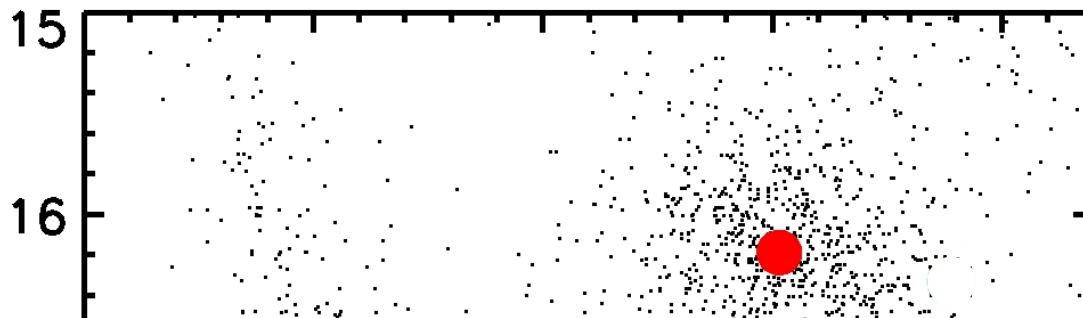
OGLE-2008-BLG-513 CMD



$$f_{I,obs}(t) = A(t)f_{I,S} + f_{I,B}$$

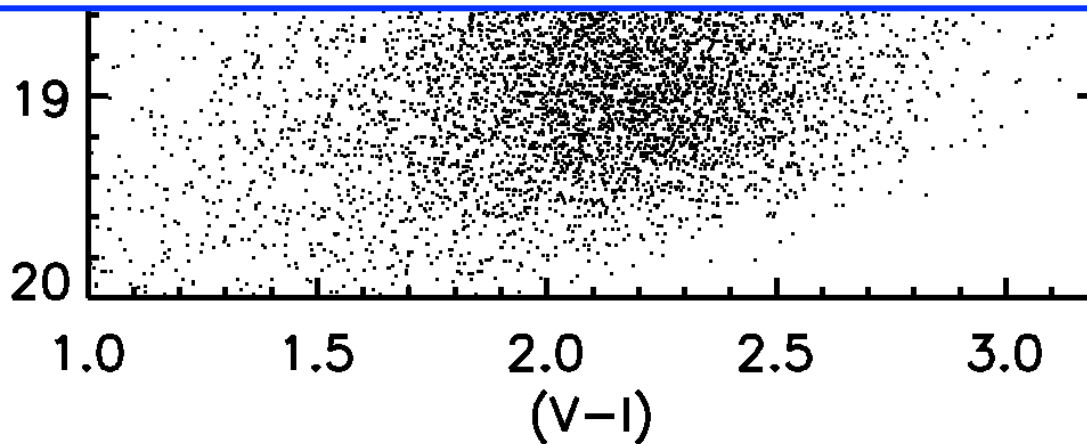


OGLE-2008-BLG-513 CMD

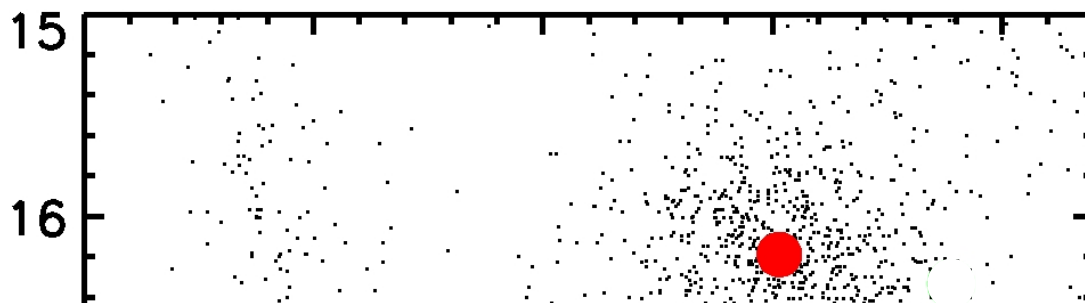


$$f_{I,obs}(t) = A(t)f_{I,S} + f_{I,B}$$

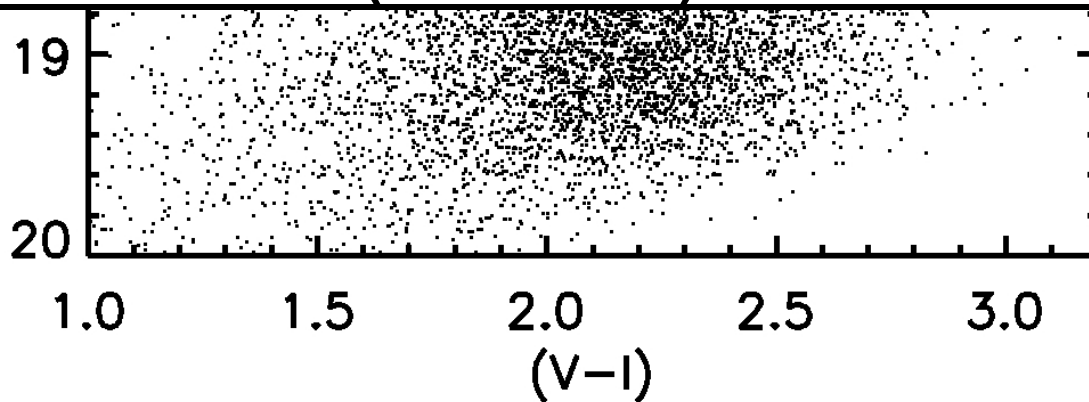
$$f_{V,obs}(t) = A(t)f_{V,S} + f_{V,B}$$

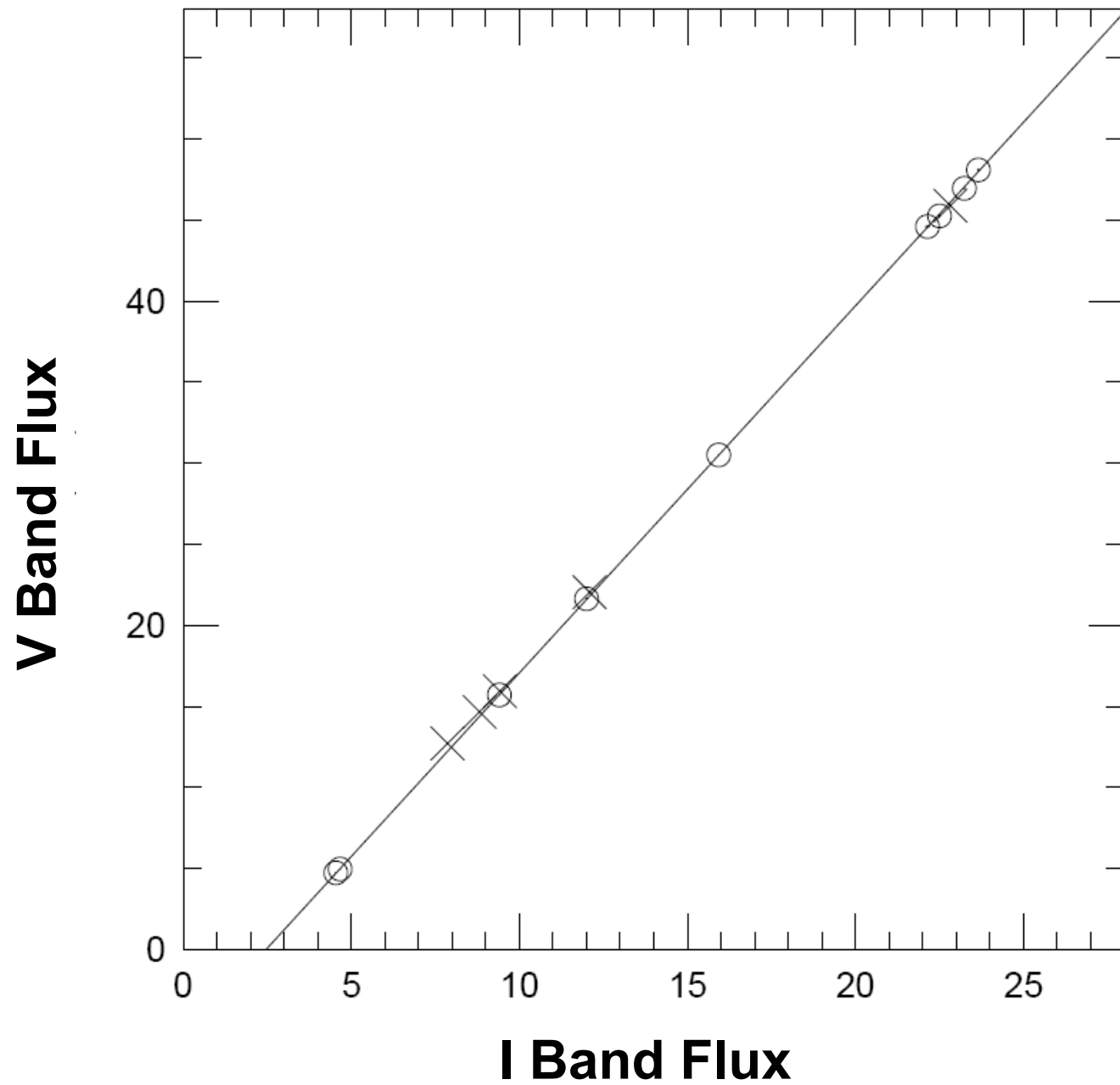


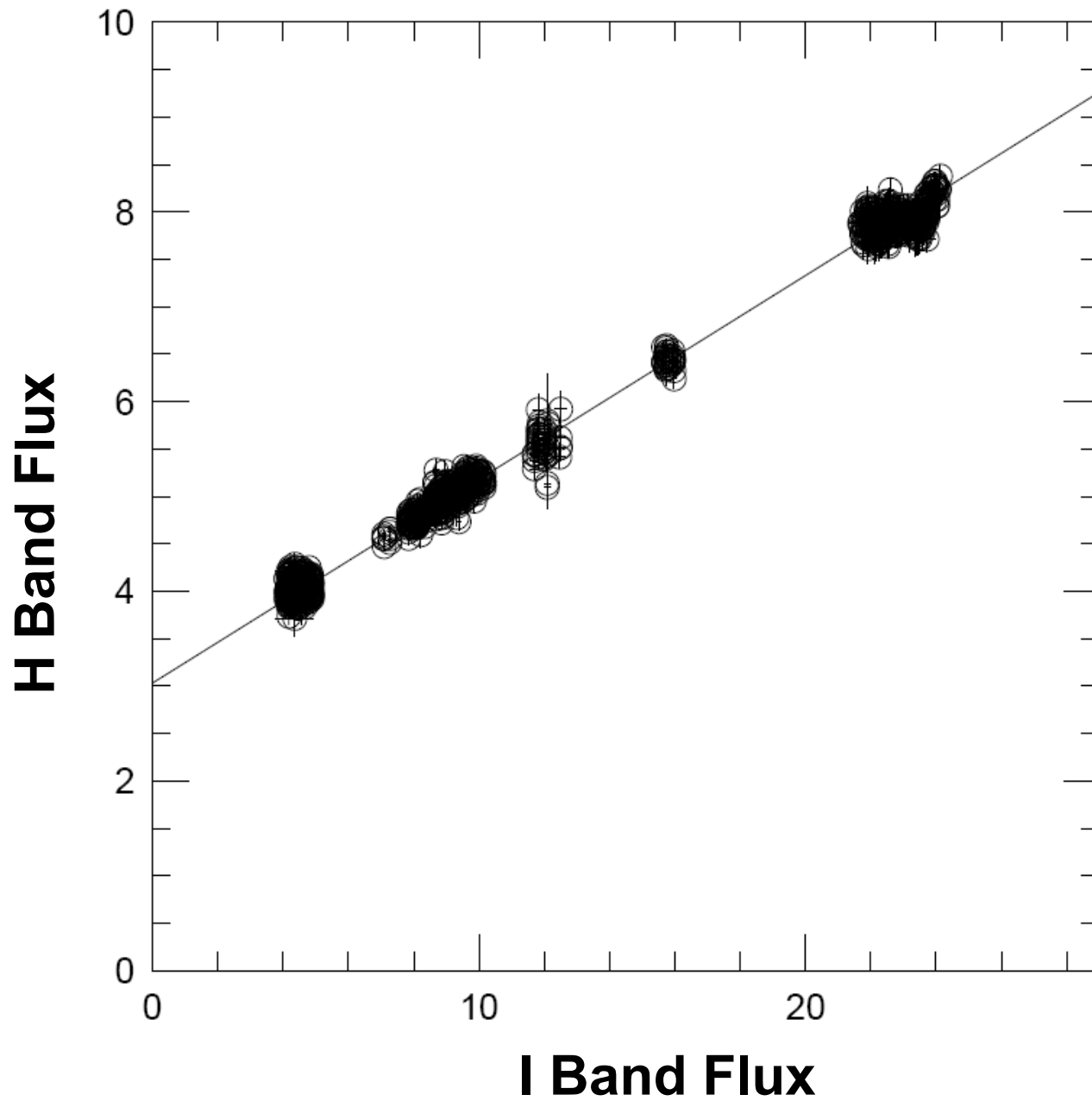
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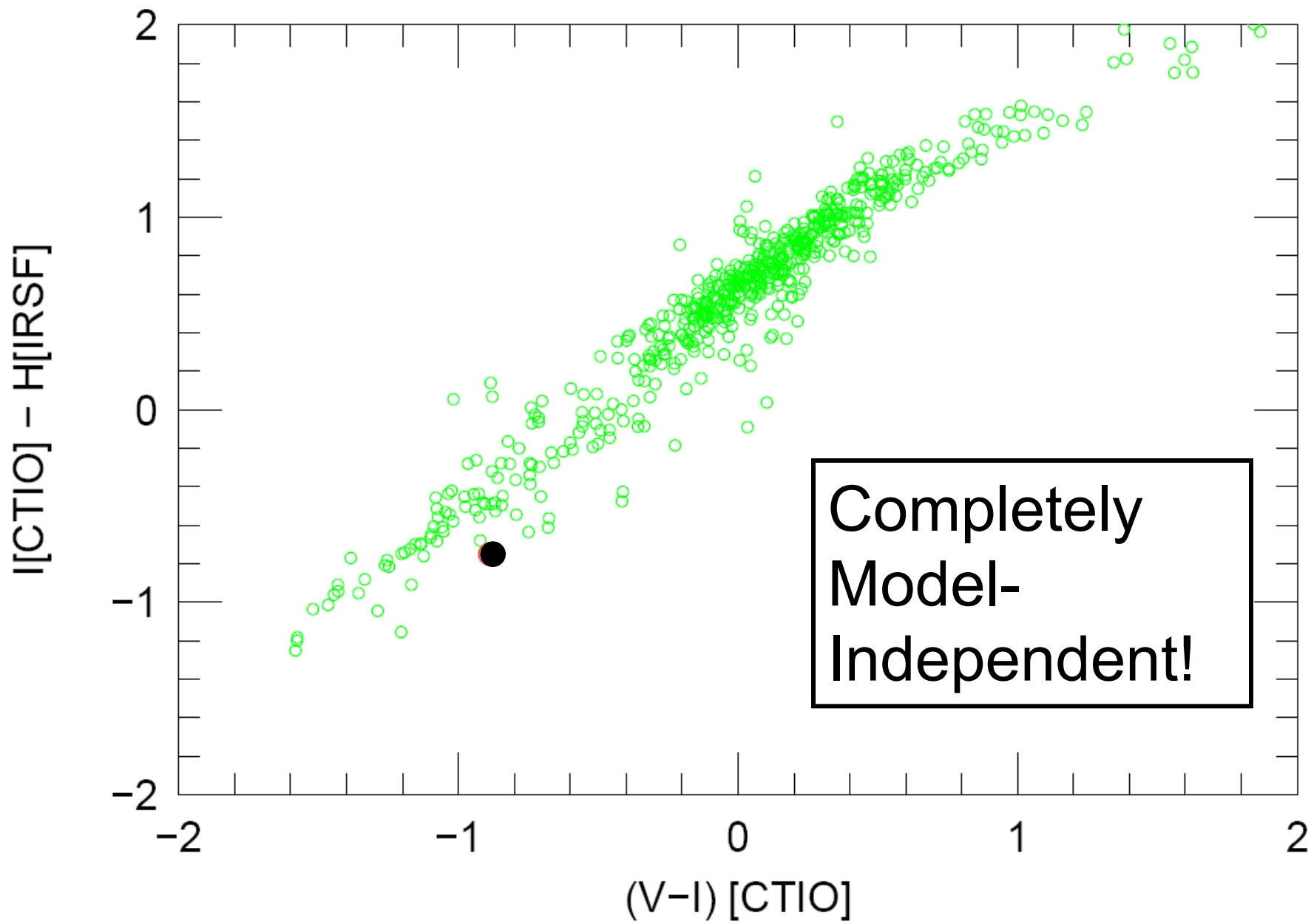


$$f_{V,obs}(t) = \left(\frac{f_{V,S}}{f_{I,S}} \right) f_{I,obs}(t) + C$$



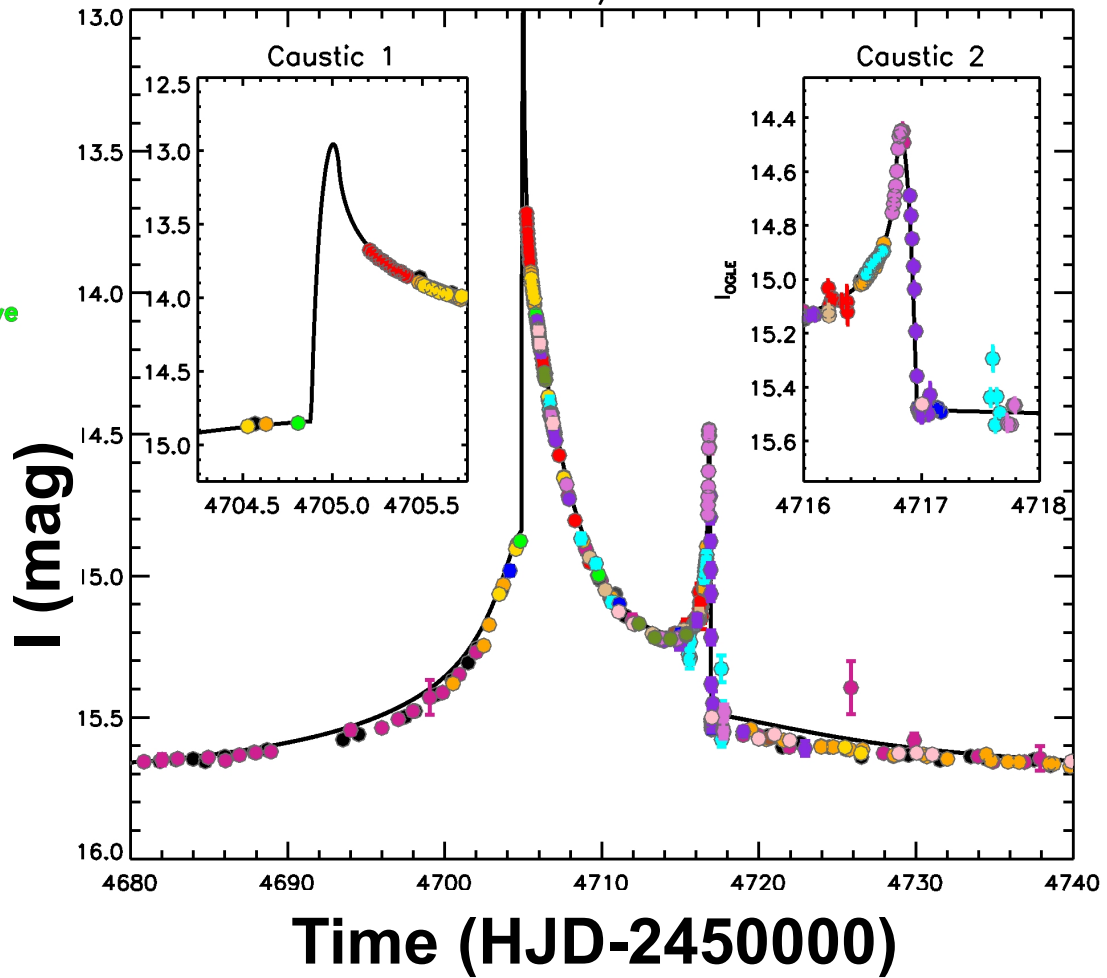


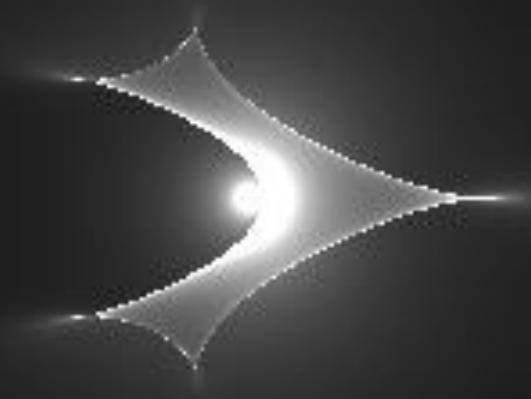




OGLE-2008-BLG-513/MOA-2008-BLG-401

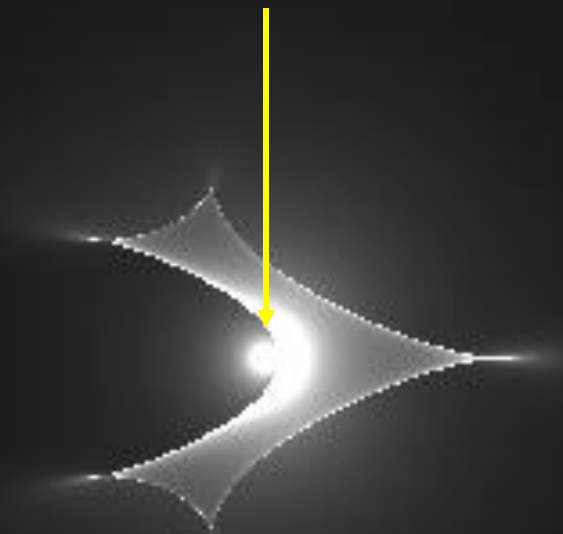
- OGLE
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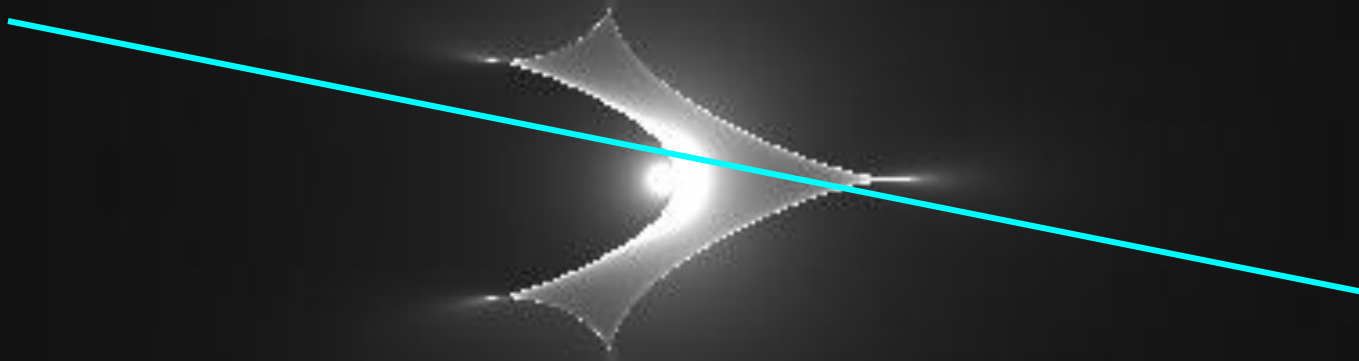




Lens Star

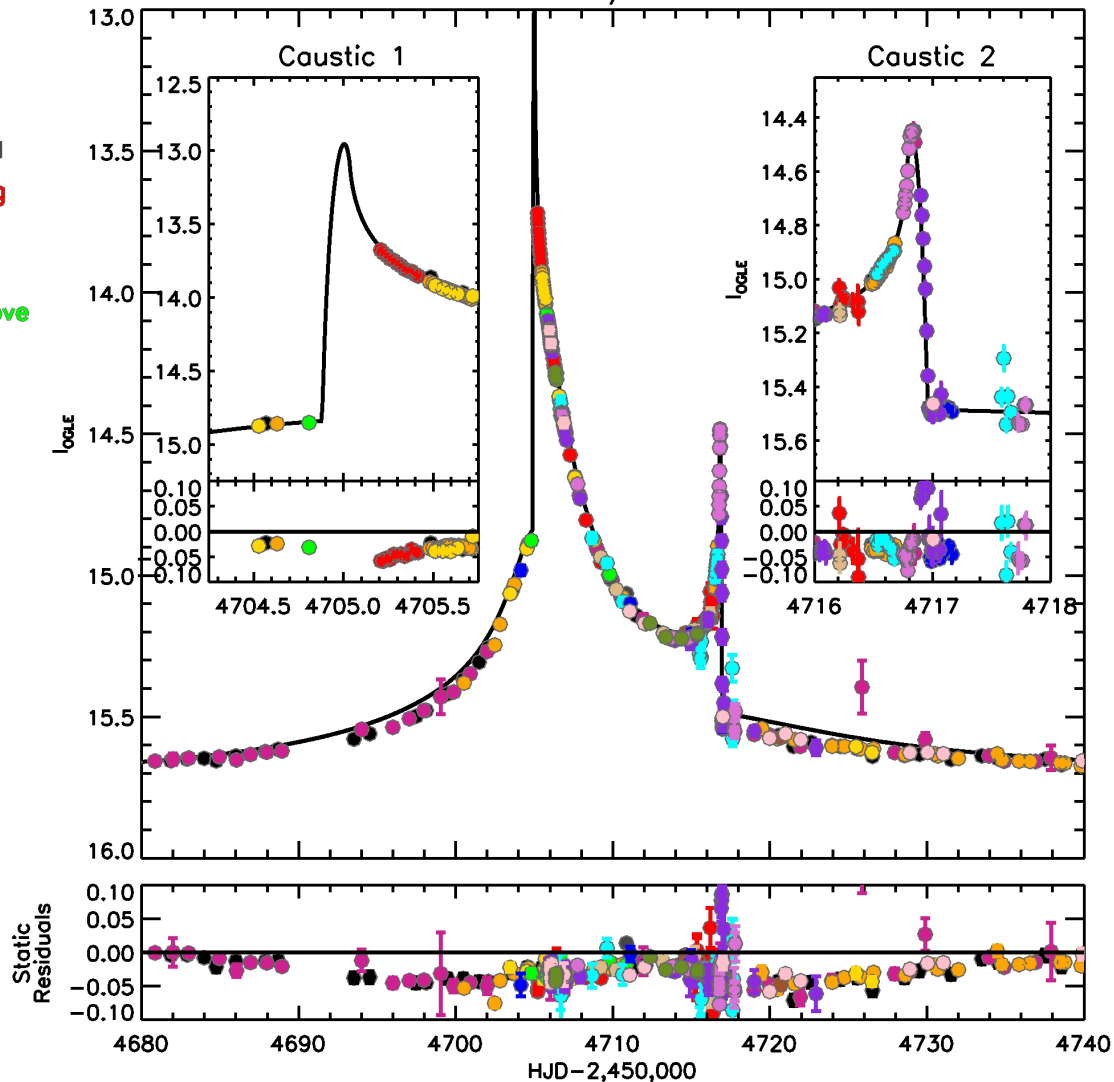
Planet

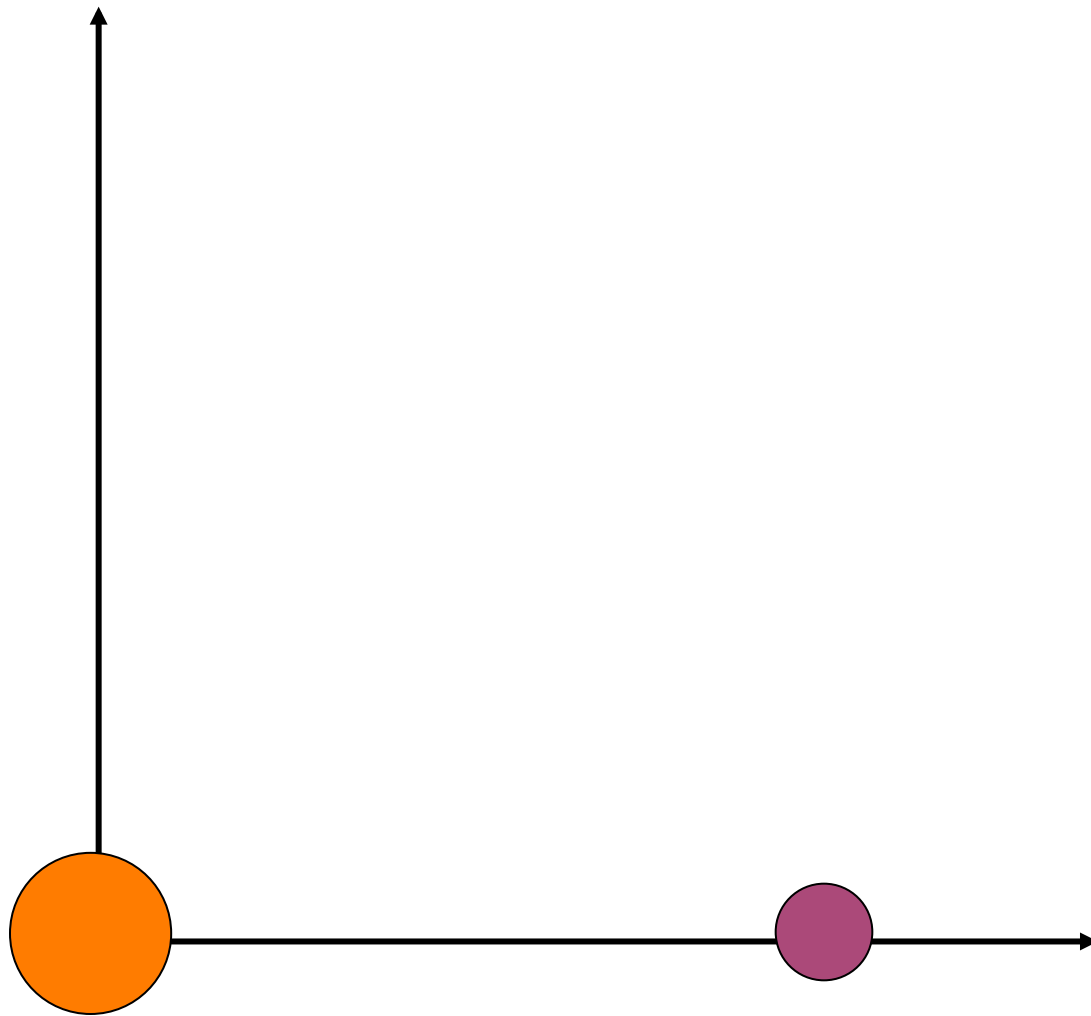


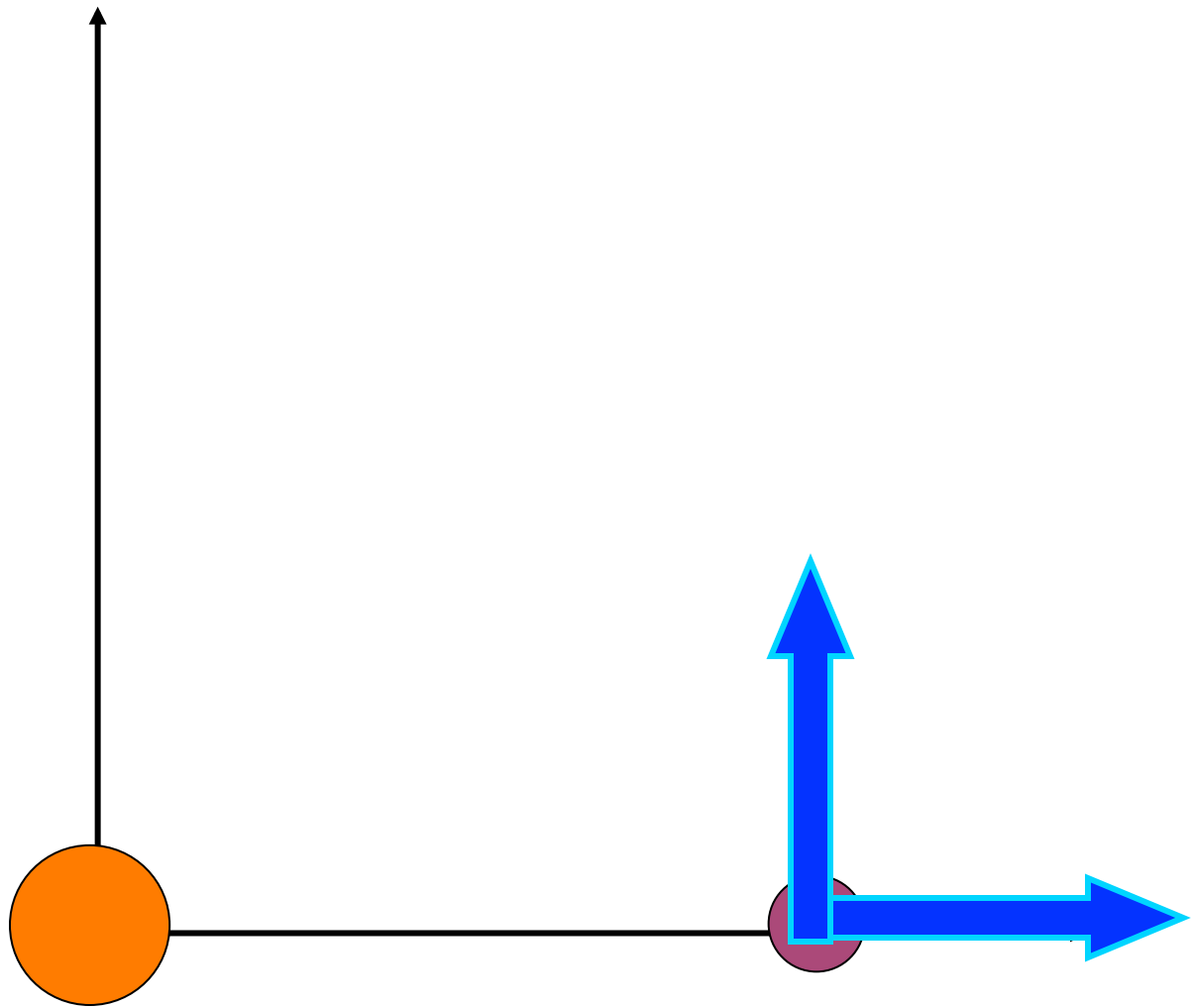


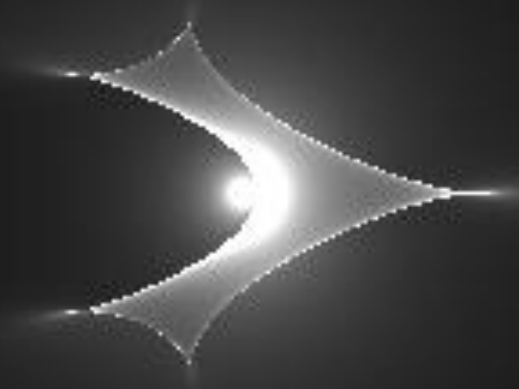
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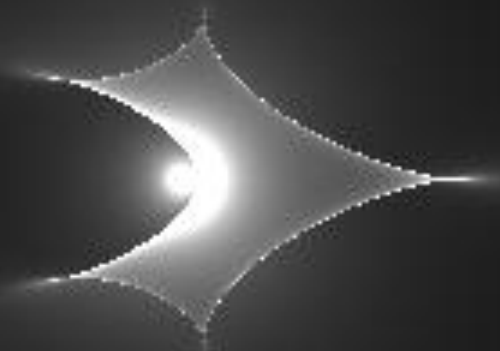
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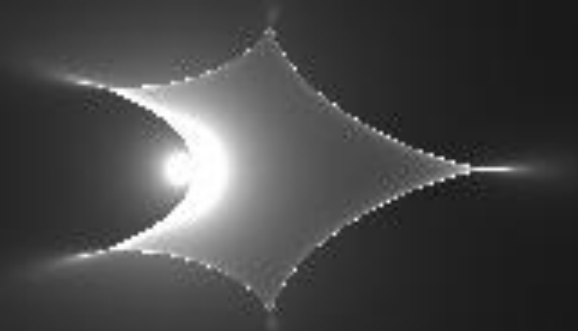


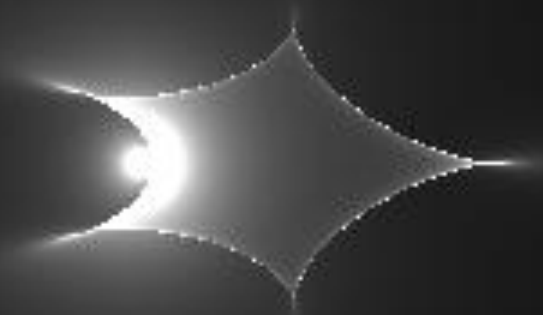


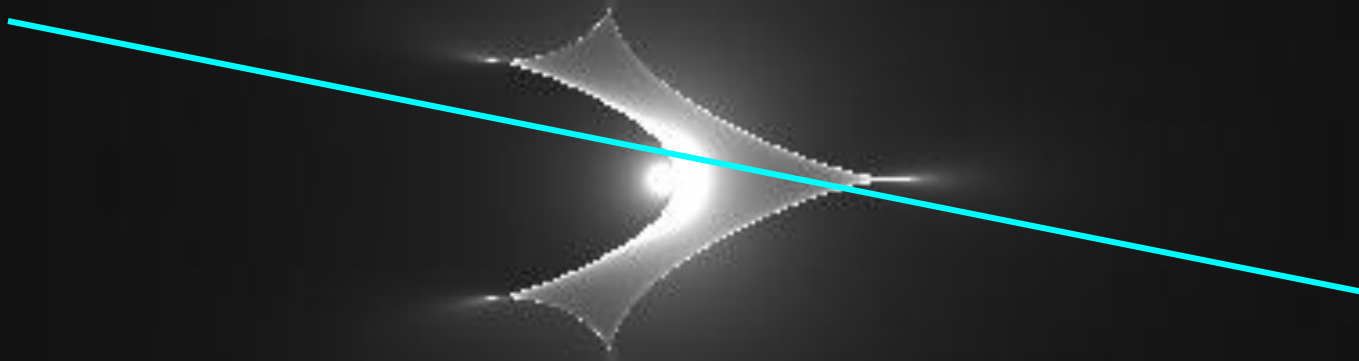


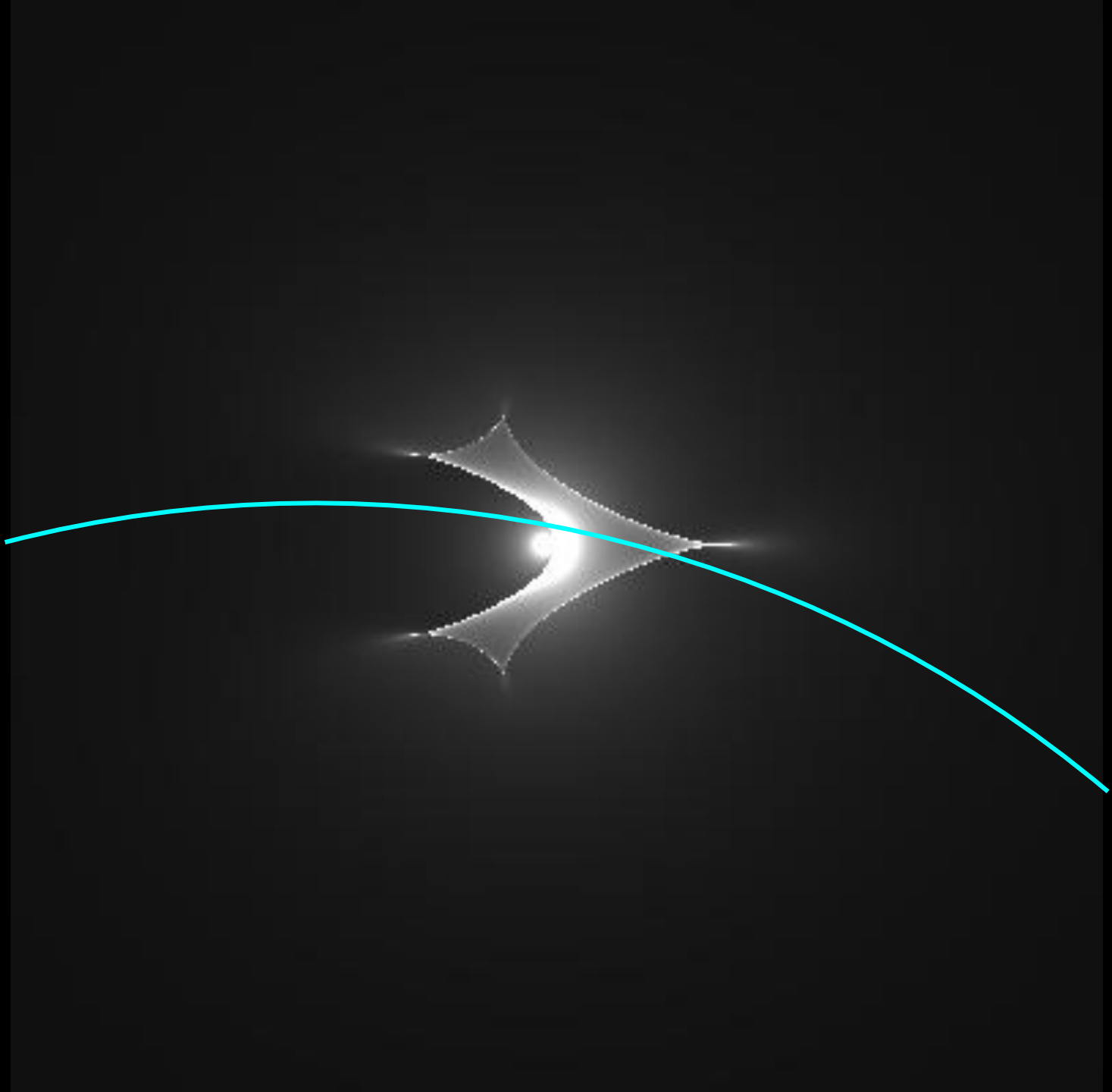






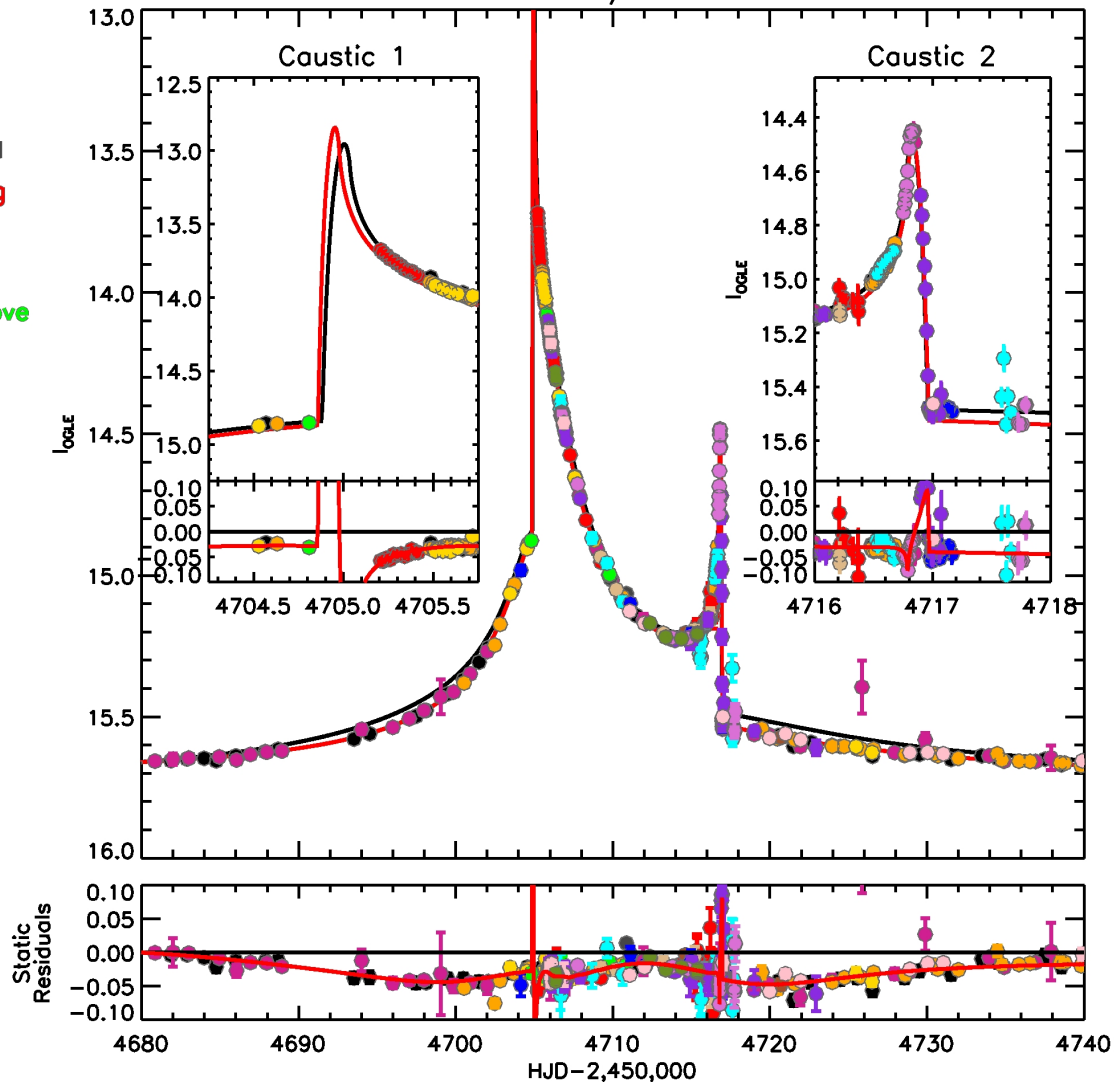






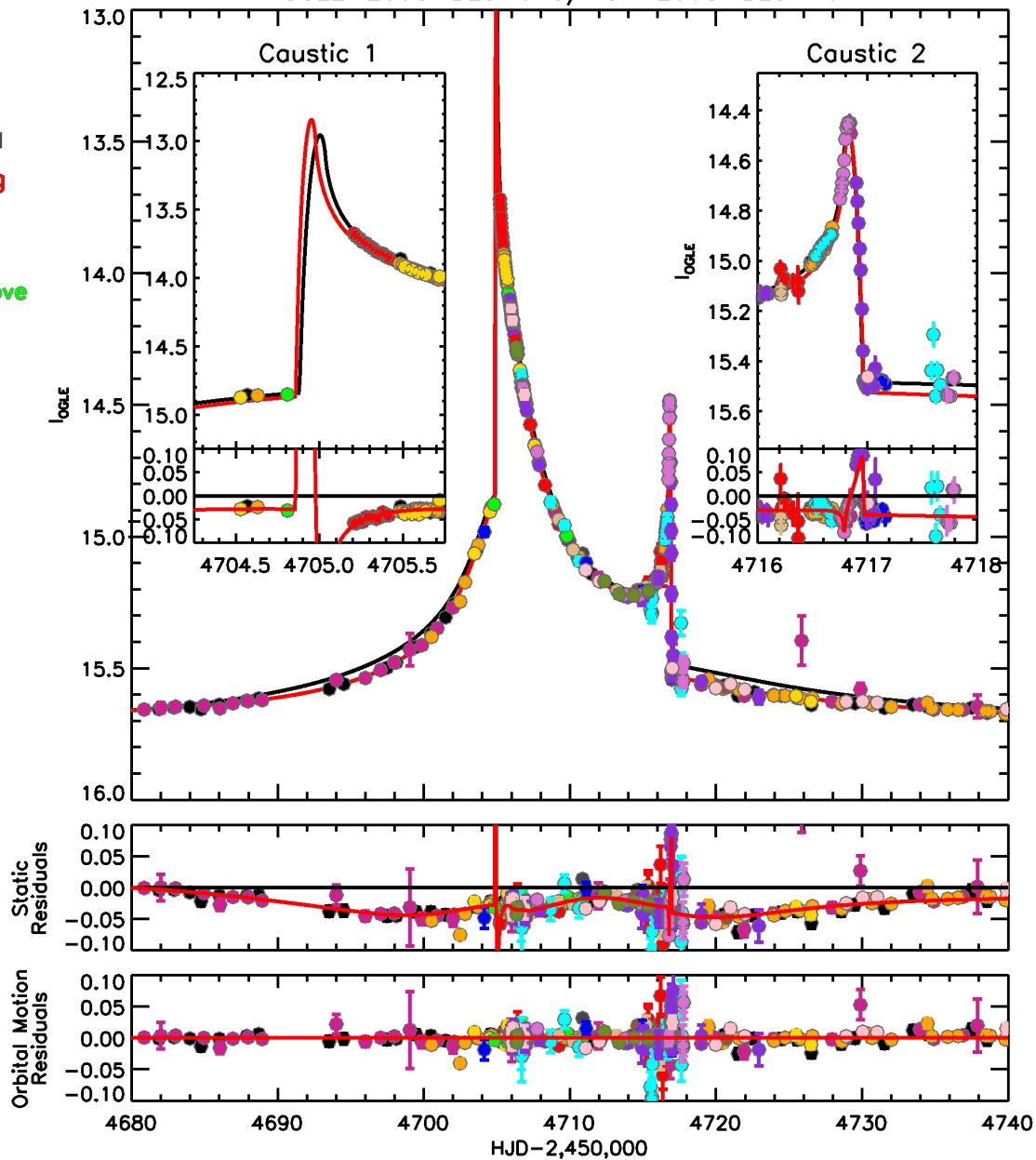
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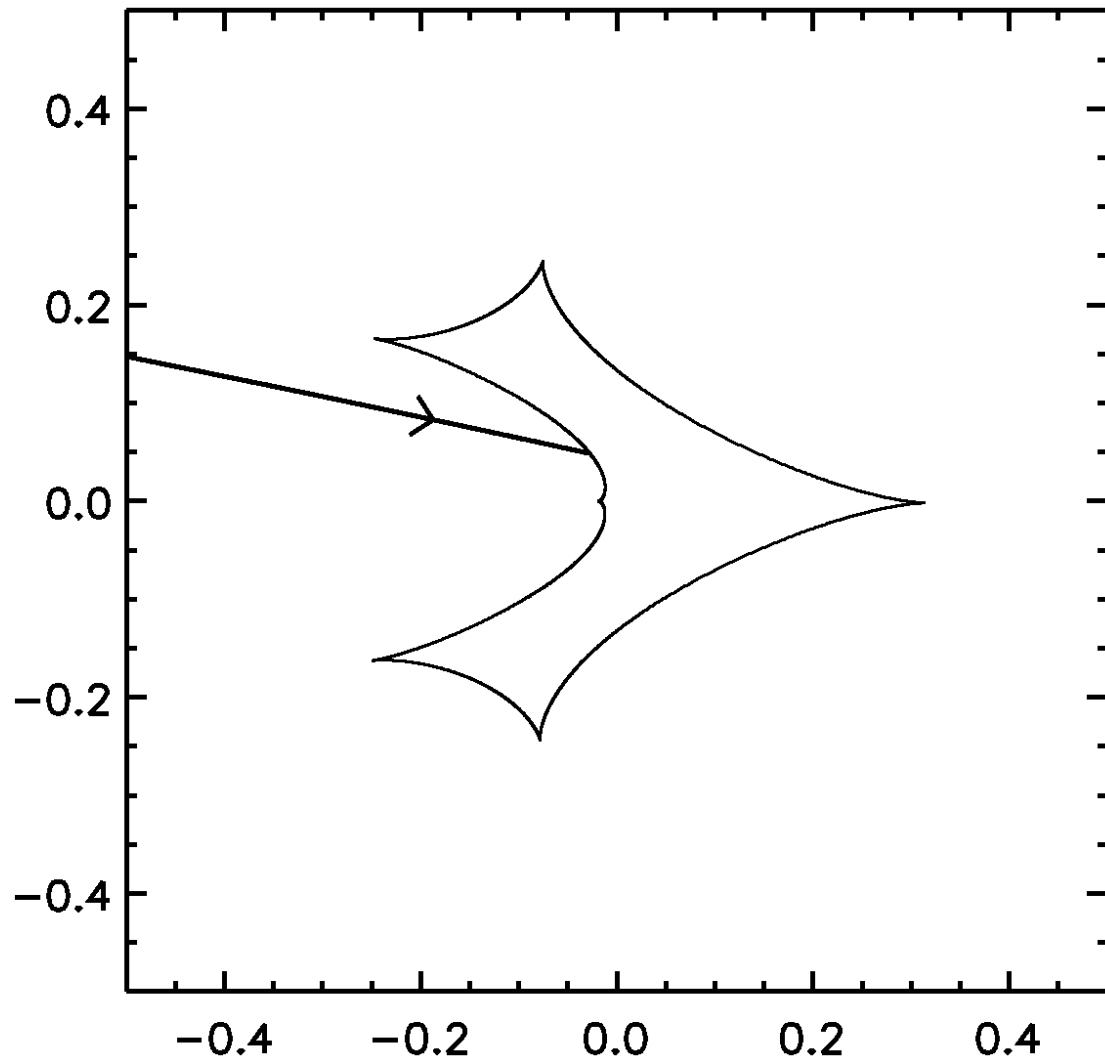
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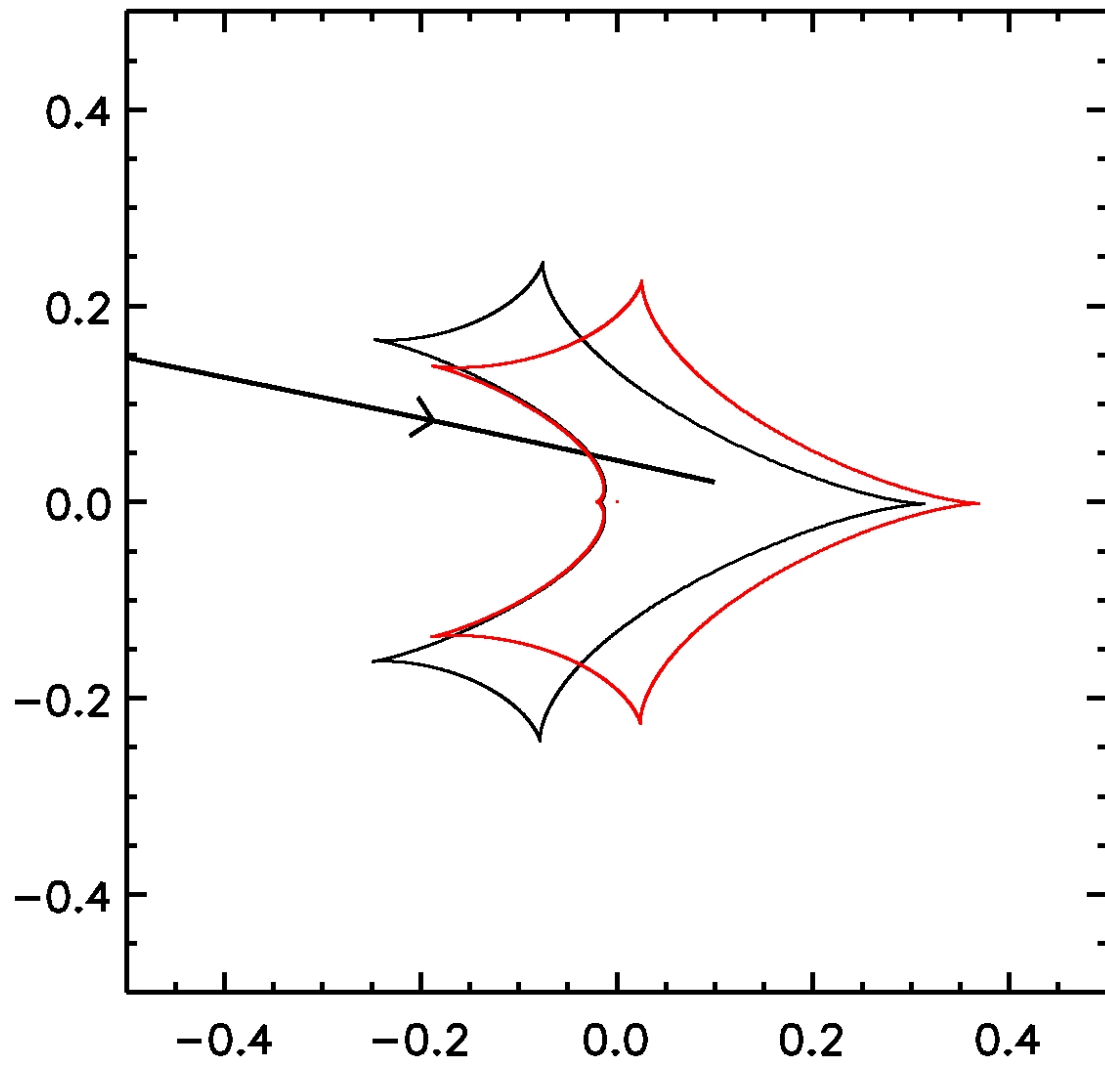


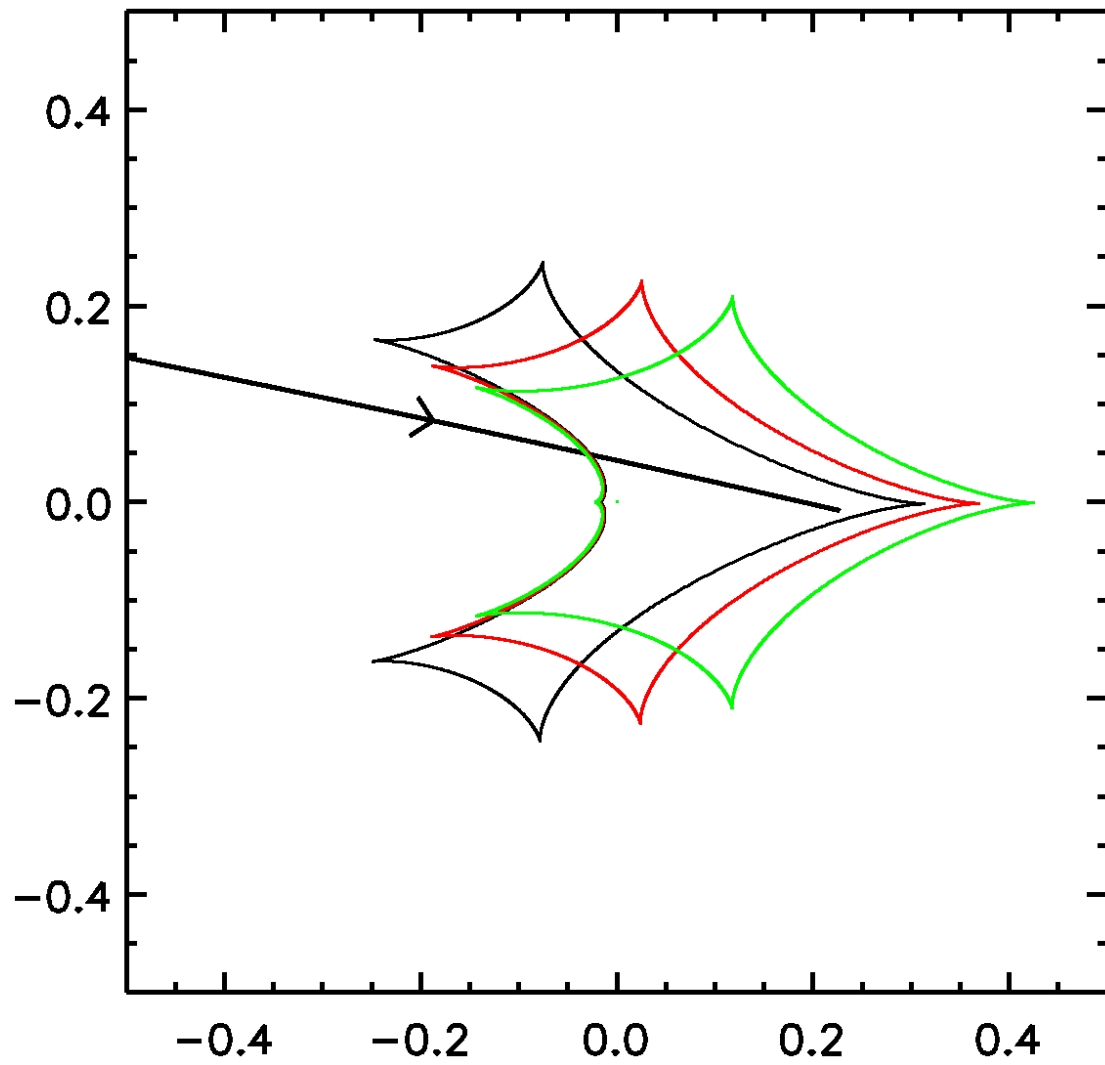
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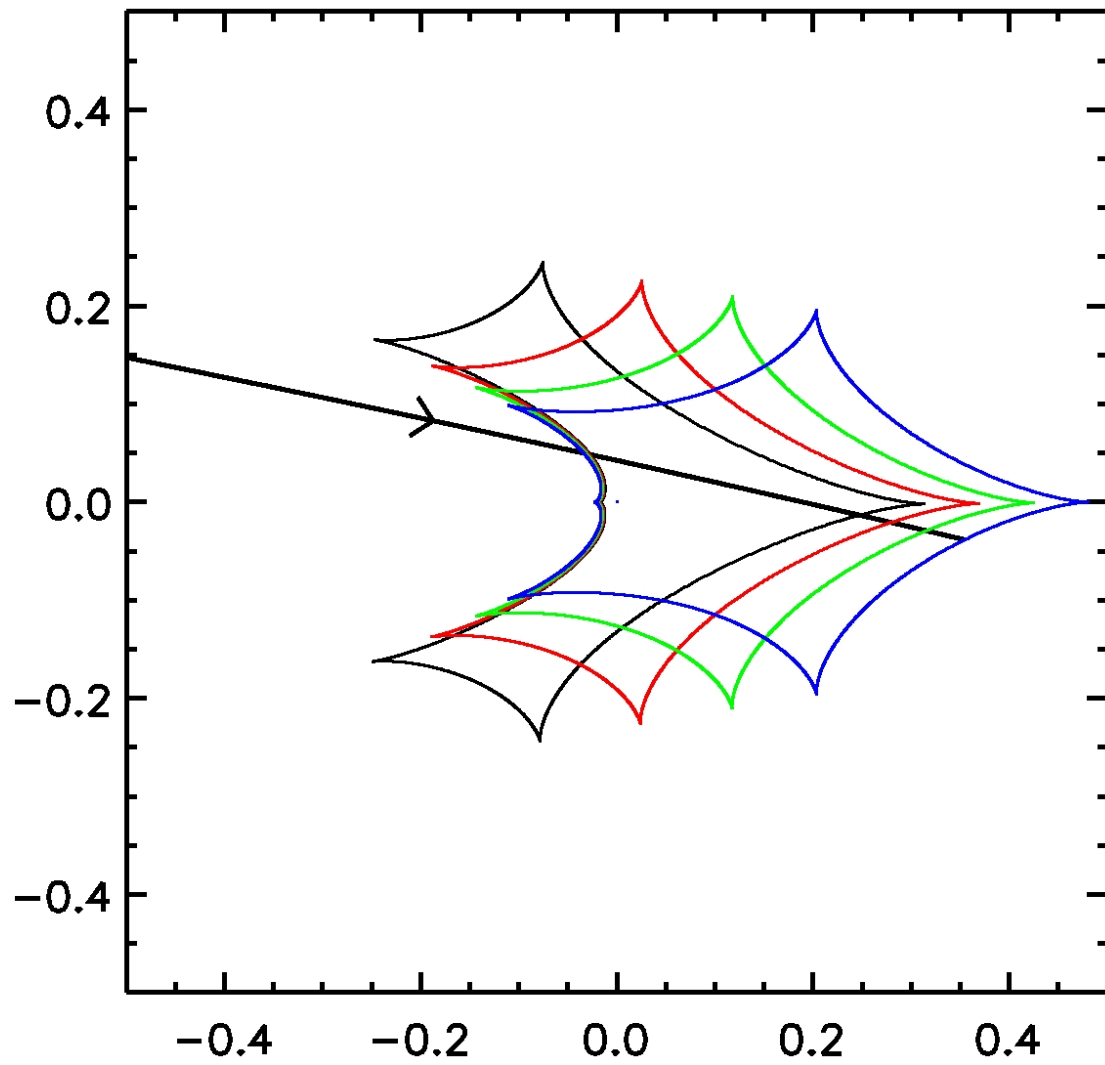
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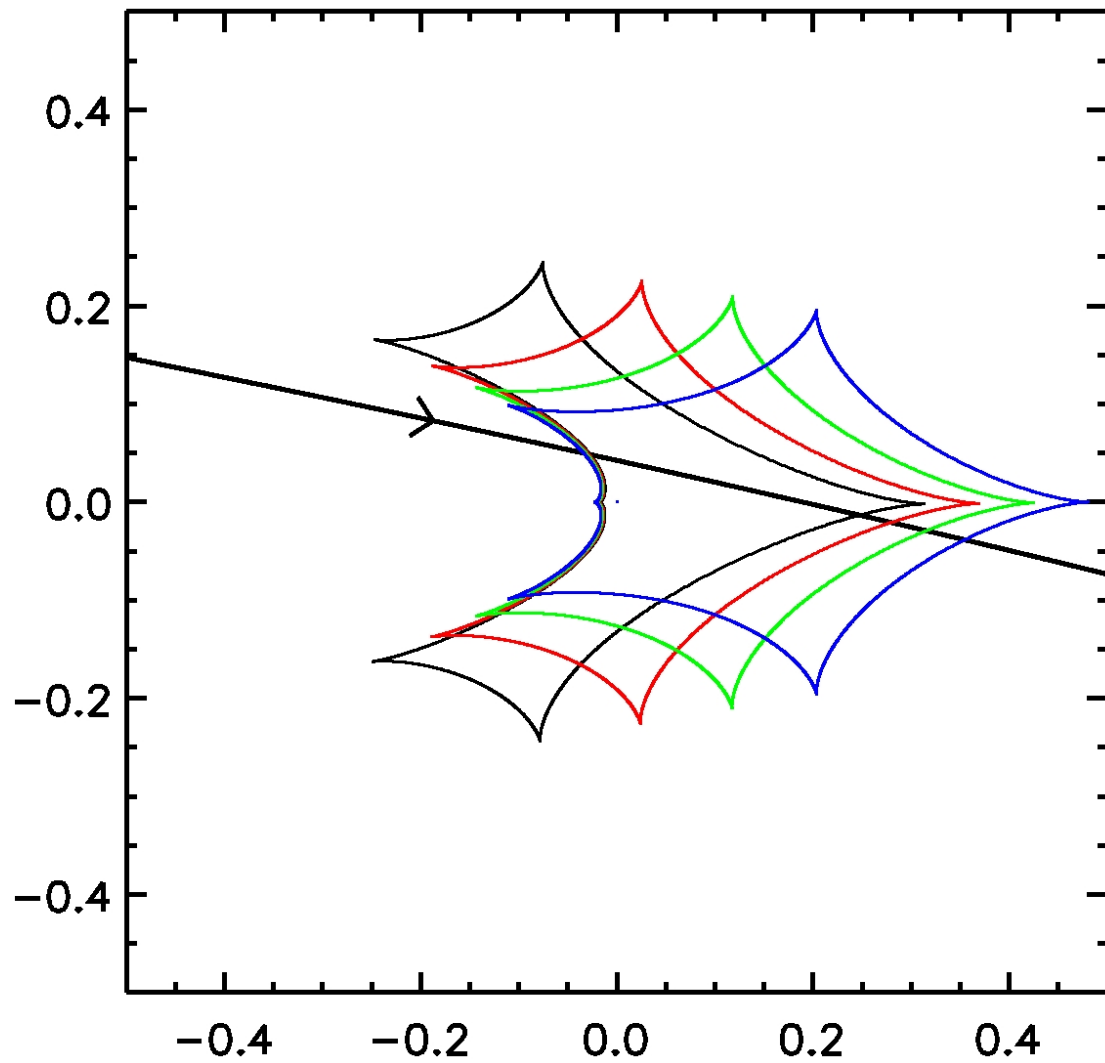






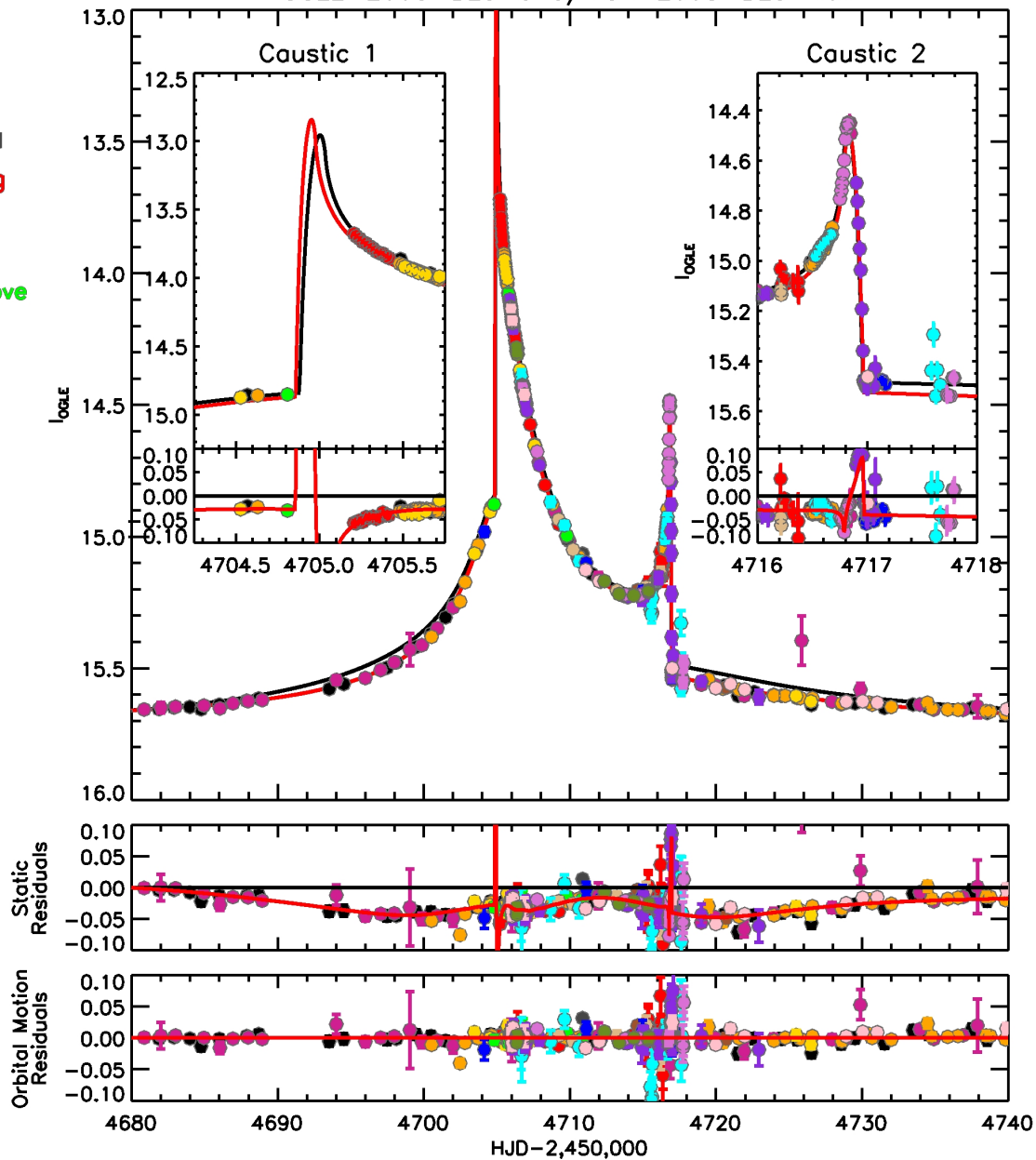






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$$\frac{KE_{\perp}}{PE_{\perp}} = \frac{\frac{1}{2}v_{\text{proj}}^2}{\frac{GM_L}{a_{\text{proj}}}}$$

$$\frac{KE_{\perp}}{PE_{\perp}} = \frac{\frac{1}{2}v_{\text{proj}}^2}{\frac{GM_L}{a_{\text{proj}}}}$$

$$M_L = \theta_E / (\kappa \pi_E) \quad a_{\text{proj}} = s_0 \theta_E D_L$$

$$v_{\text{proj}} = s_0 \theta_E D_L \sqrt{\gamma_{\perp}^2 + \gamma_{\parallel}^2}$$

$$\frac{KE_{\perp}}{DE} = \frac{\frac{1}{2}v_{\text{proj}}^2}{GM_{\perp}}$$

$$\theta_E, \pi_E,$$

$$M_L D_L = \text{AU}/(\theta_E \pi_E + \pi_S) D_L$$

$$v_{\text{proj}} = s_0 \theta_E D_L \sqrt{\gamma_{\perp}^2 + \gamma_{\parallel}^2}$$

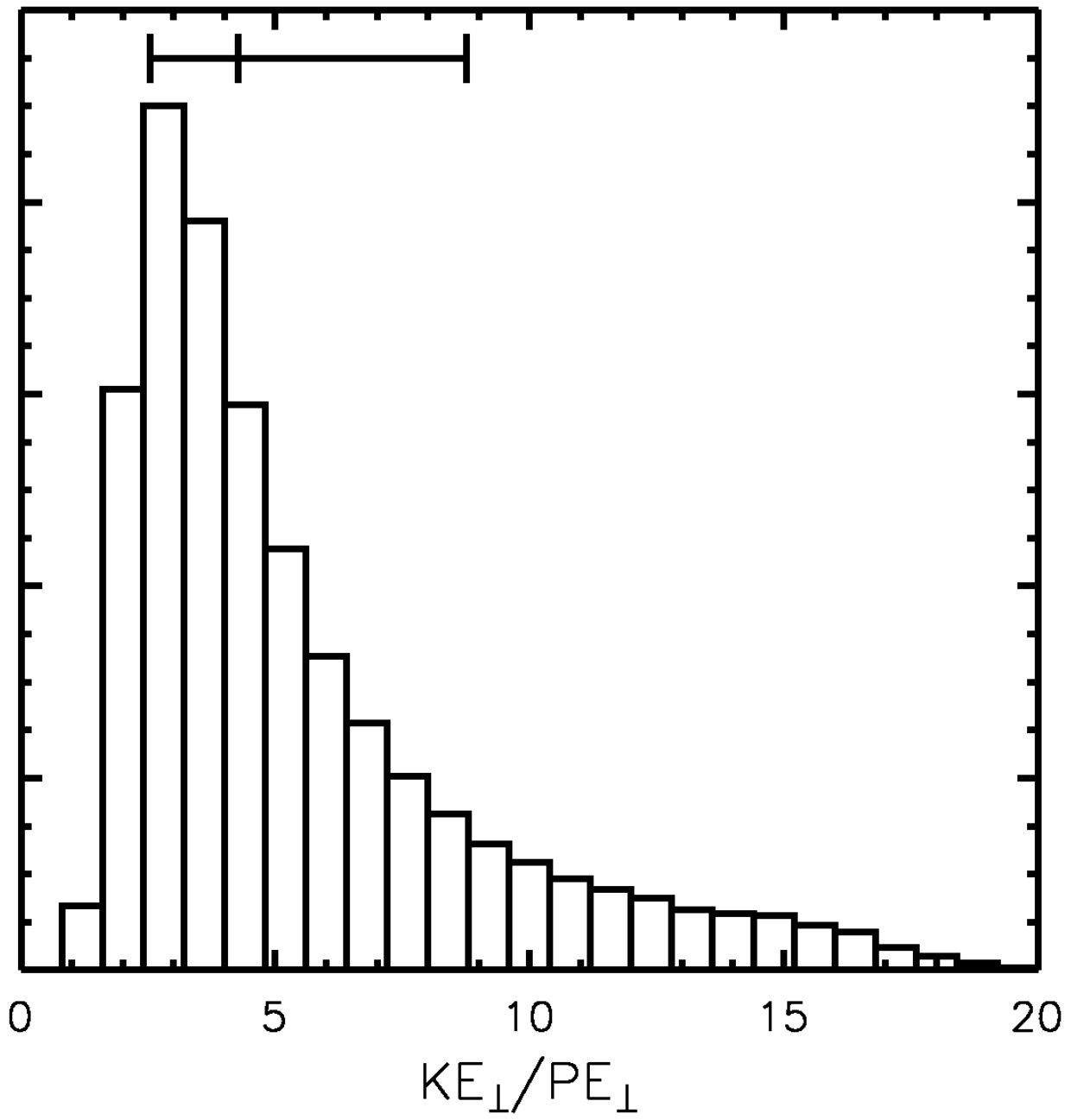
$$\frac{KE_{\perp}}{DE} = \frac{\frac{1}{2}v_{\text{proj}}^2}{GM_{\perp}}$$

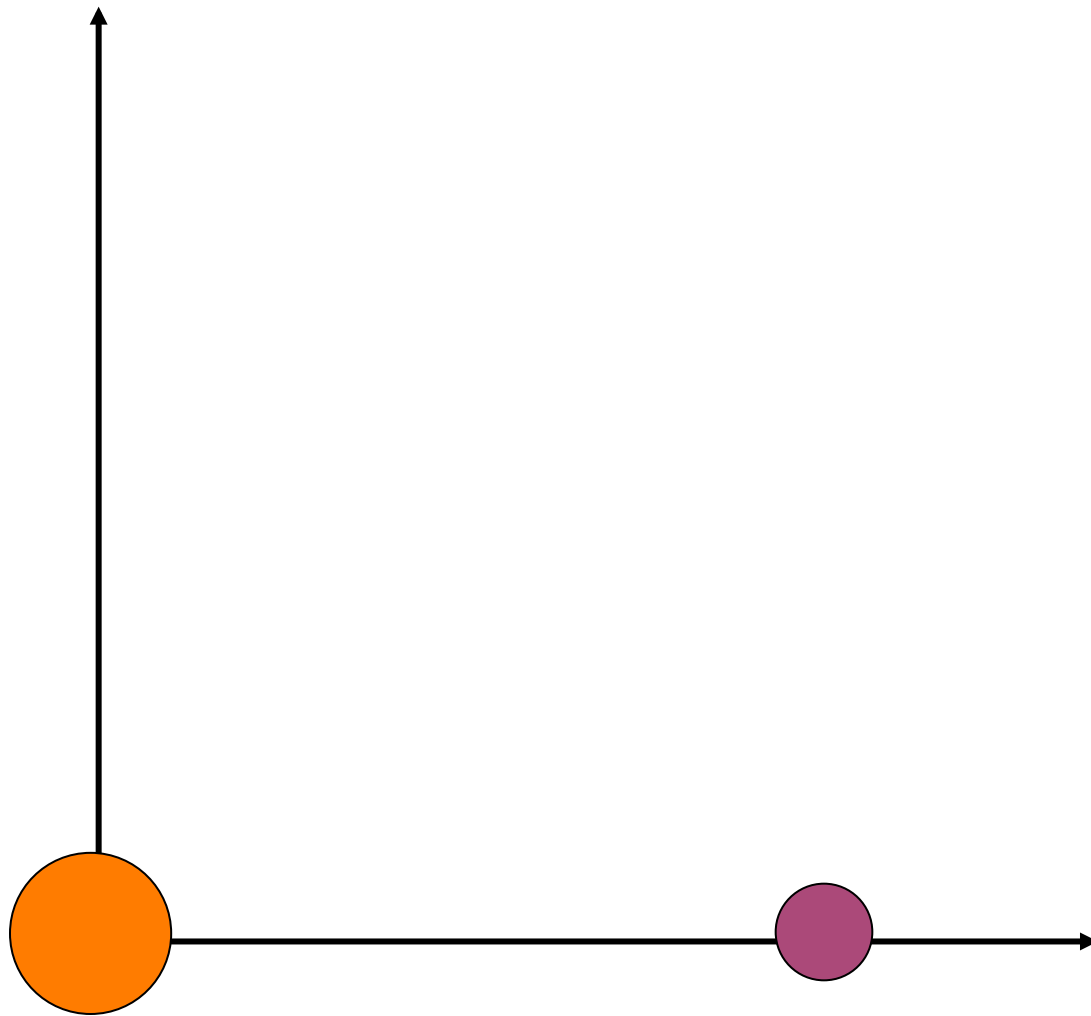
M_L

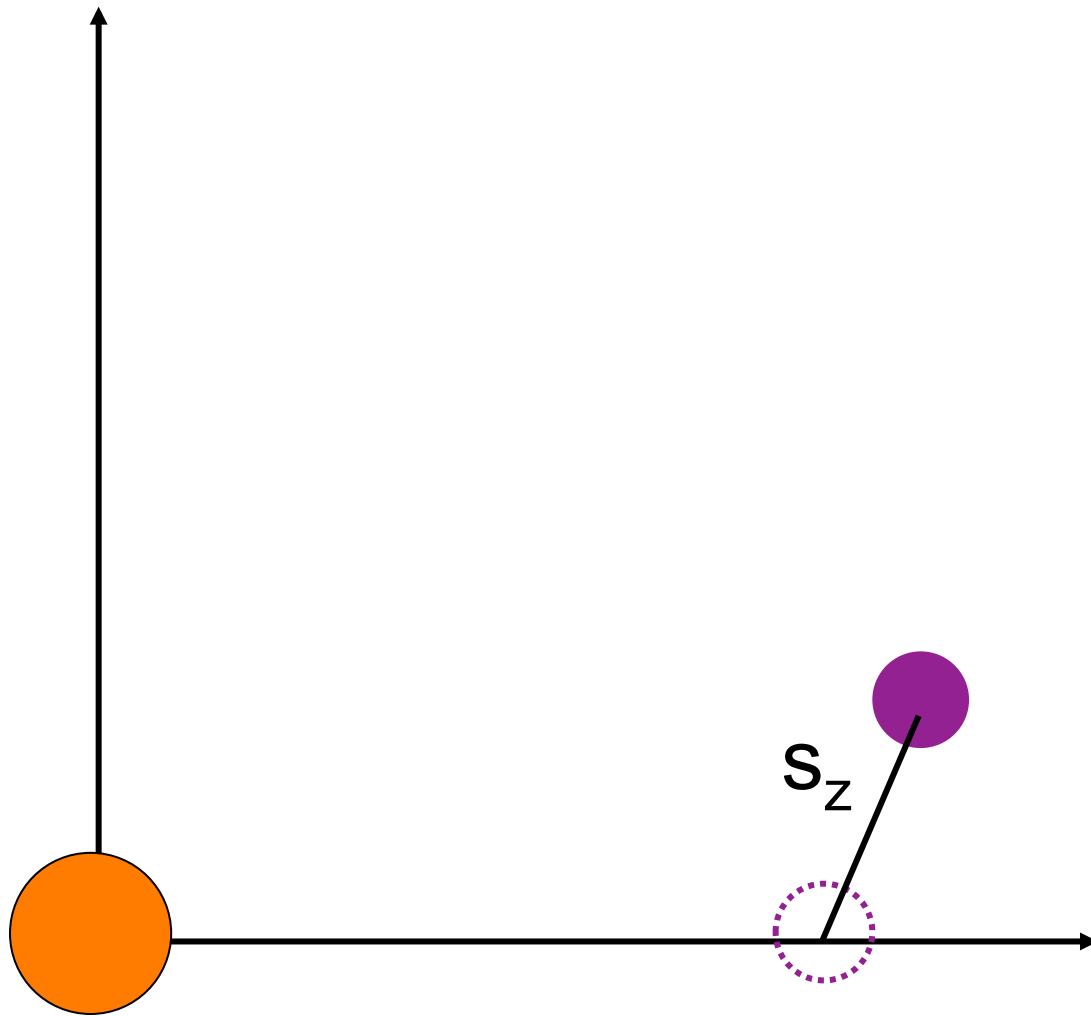
$$\theta_E, \pi_E, D_S$$

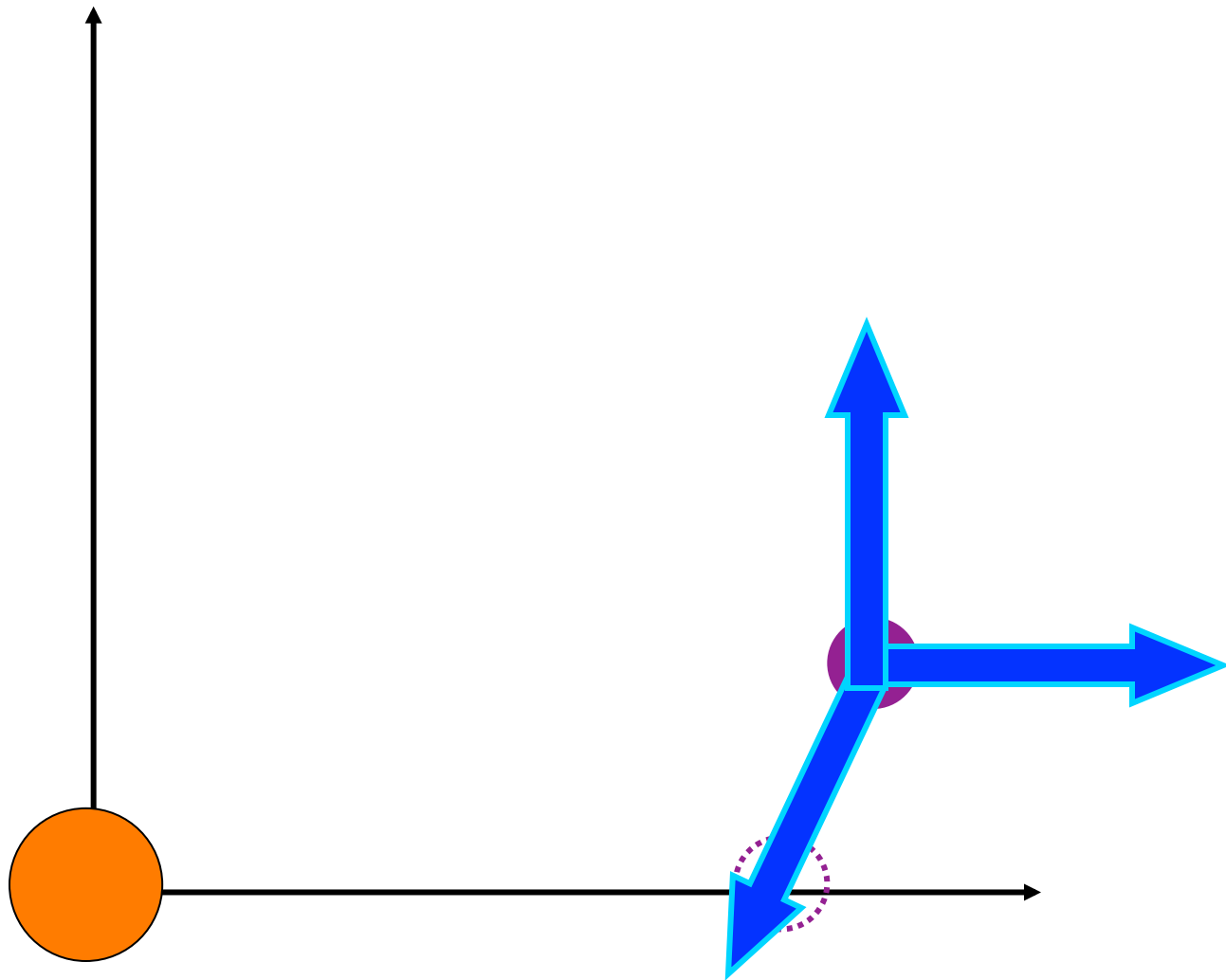
D_L

$$v_{\text{proj}} = s_0 \theta_E D_L \sqrt{\gamma_{\perp}^2 + \gamma_{\parallel}^2}$$

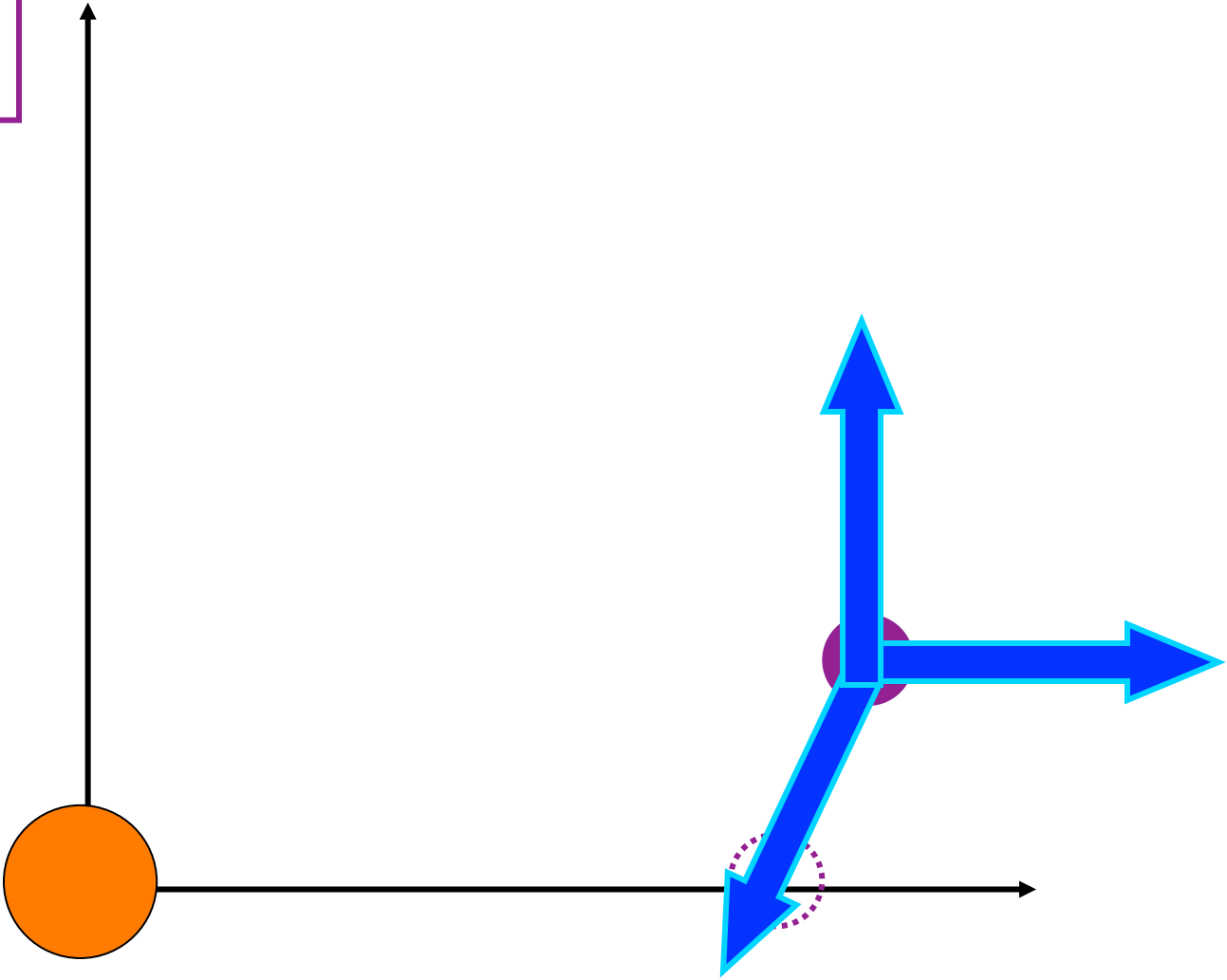






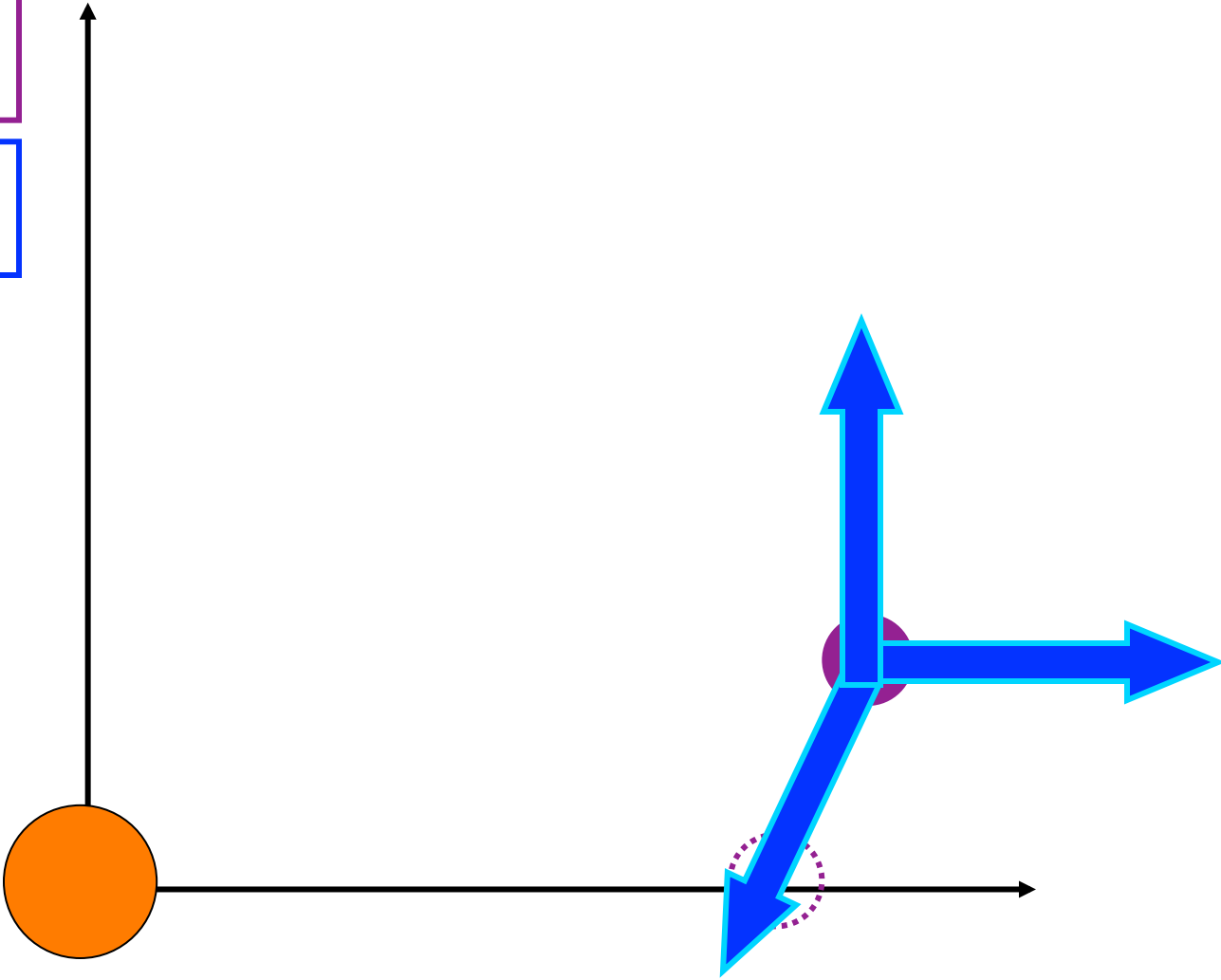


s, s_z, α_0



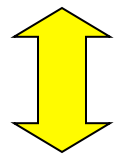
s, s_z, α_0

$\gamma_{\parallel}, \gamma_{\perp}, \gamma_z$

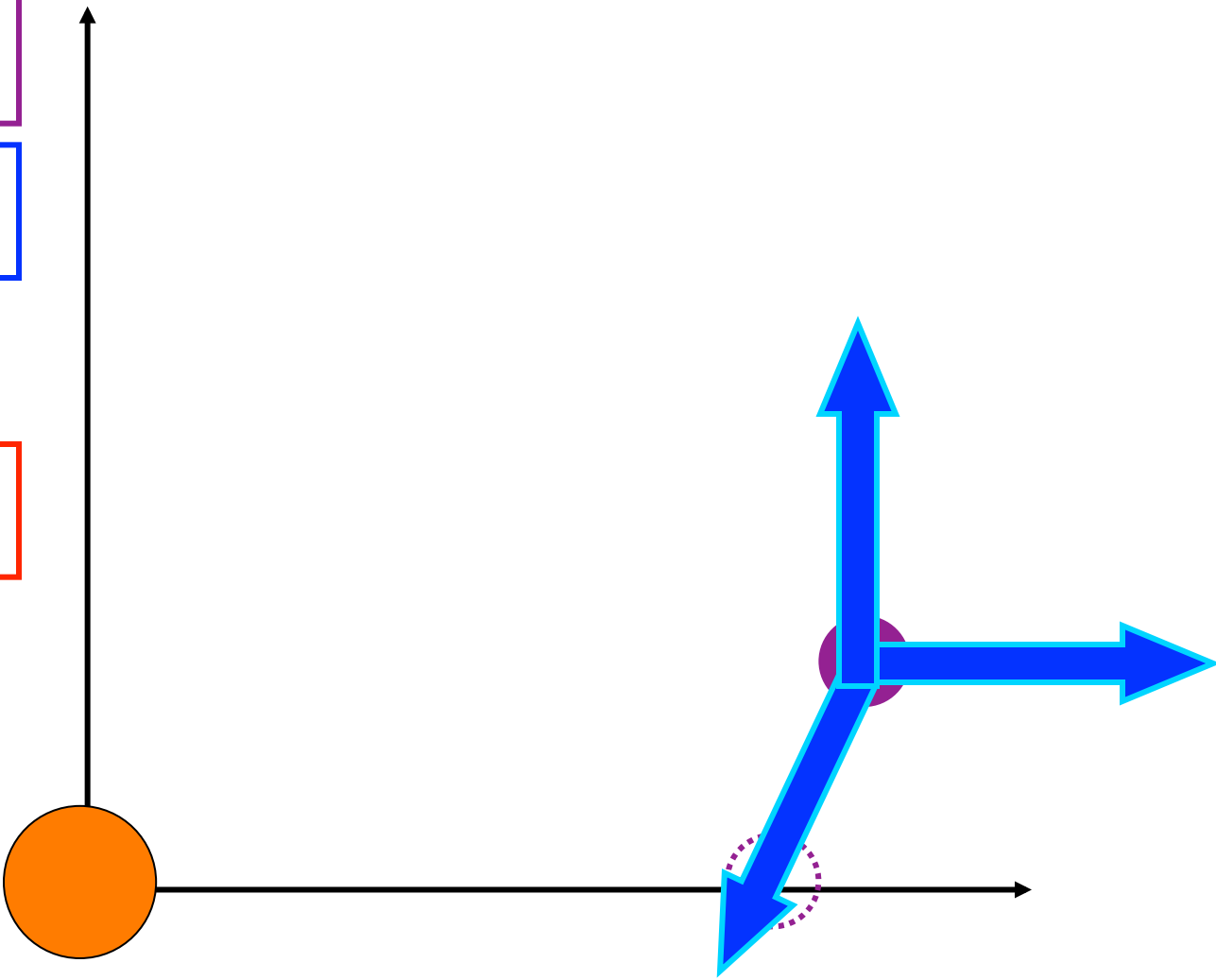


s, s_z, α_0

$\gamma_{\parallel}, \gamma_{\perp}, \gamma_z$

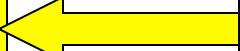
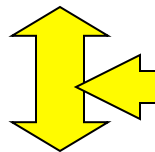


e, a, t_{peri}



s, s_z, α_0

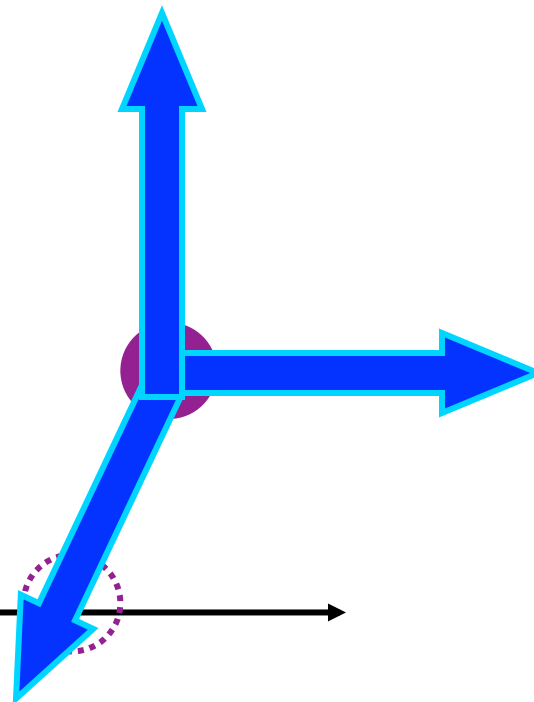
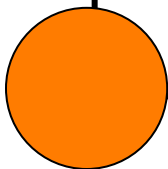
$\gamma_{\parallel}, \gamma_{\perp}, \gamma_z$



θ_E, π_E, D_S

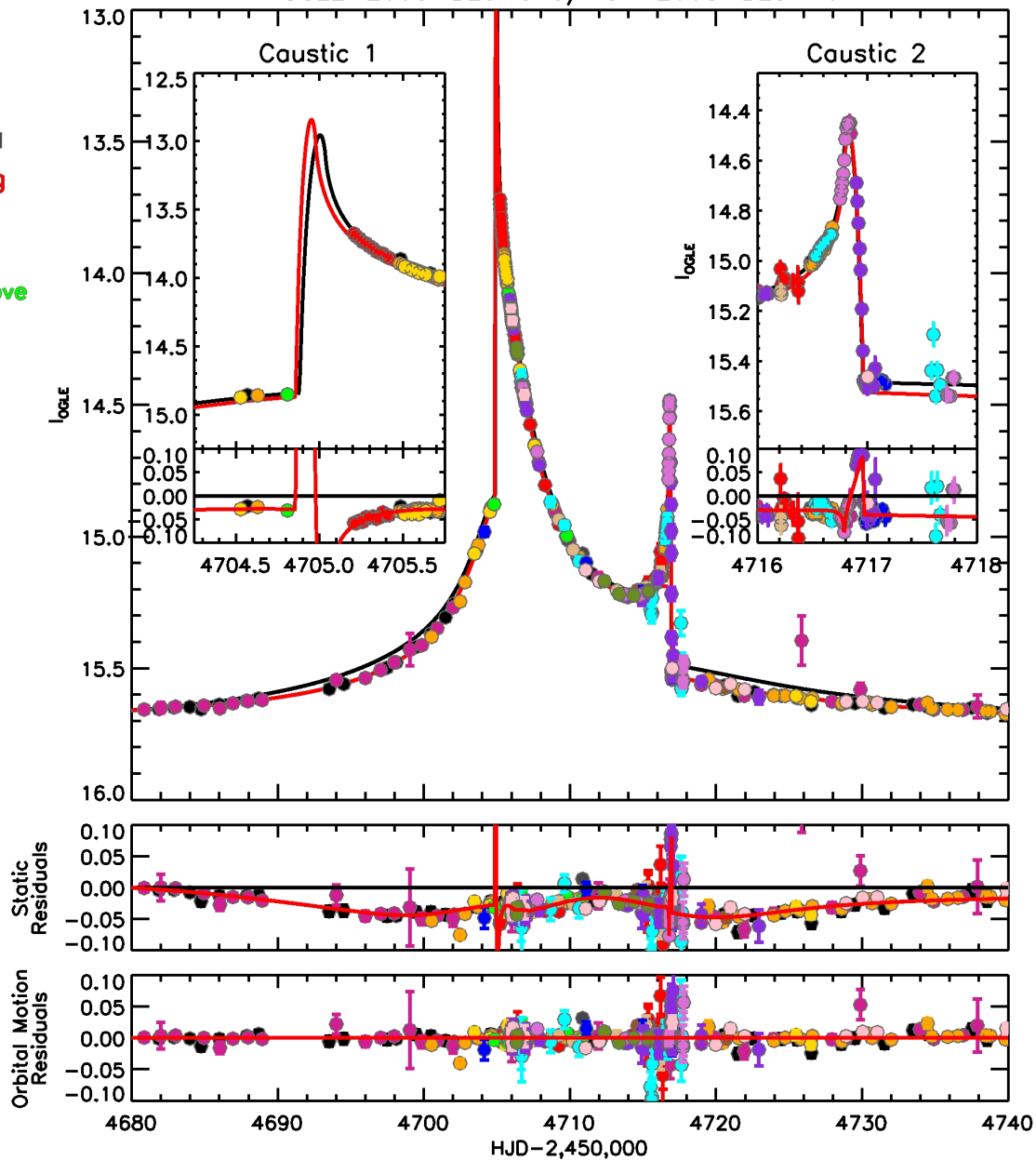
e, a, t_{peri}

$\theta_1 = \Omega$
 $\theta_2 = i$
 $\theta_3 = \omega_{\text{peri}}$

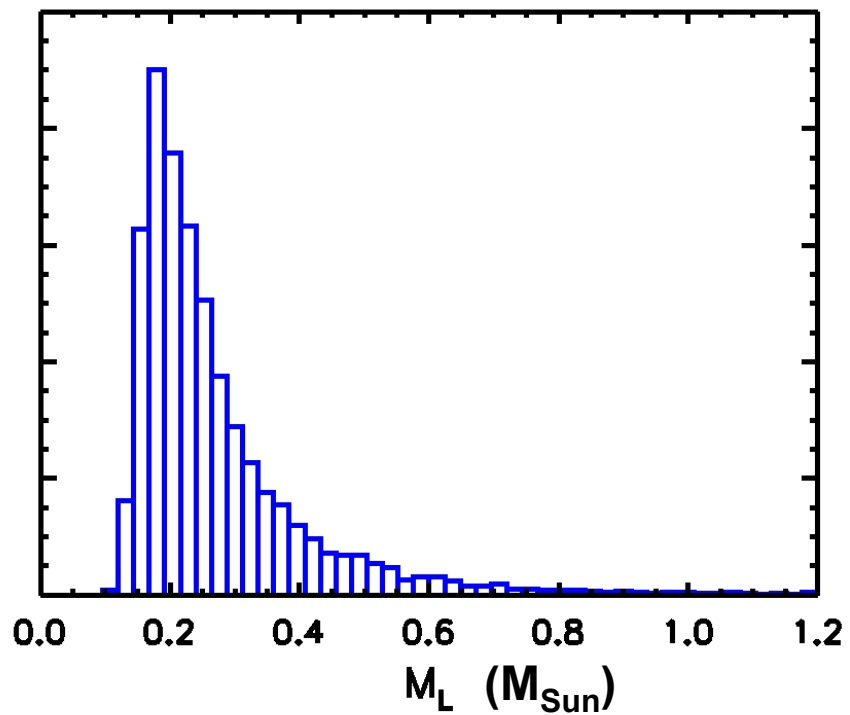


OGLE-2008-BLG-513/MOA-2008-BLG-401

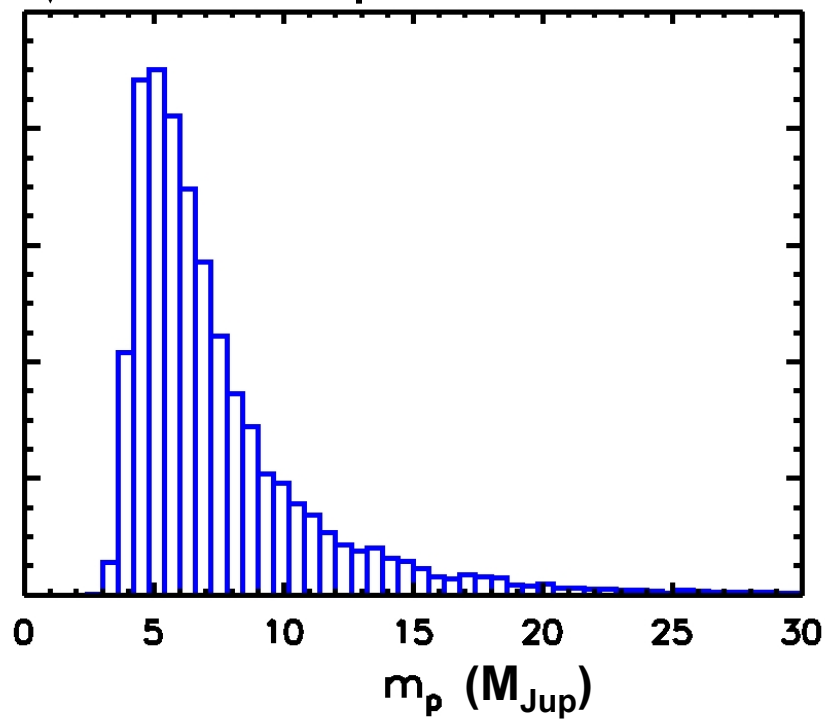
- OGLE
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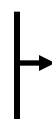
The Sun



Jupiter



Brown Dwarf

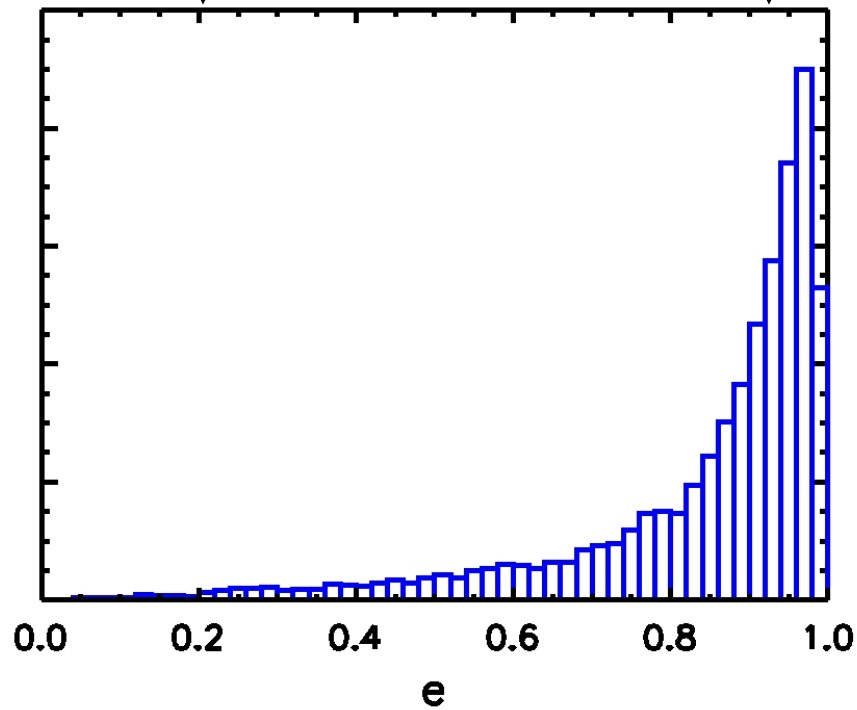
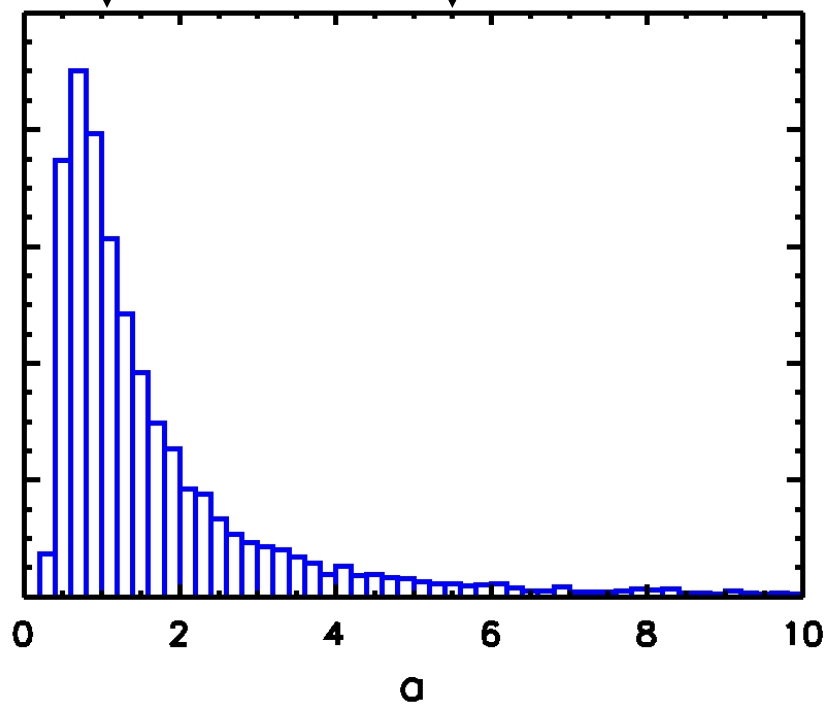


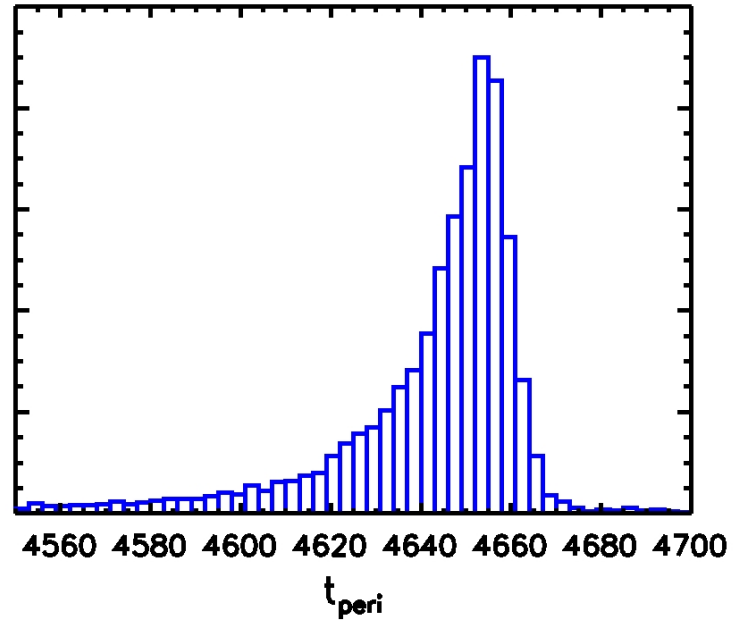
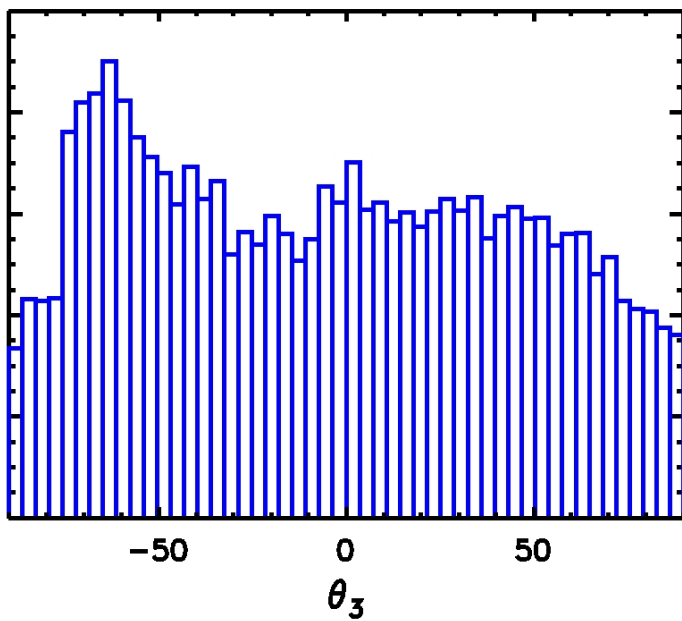
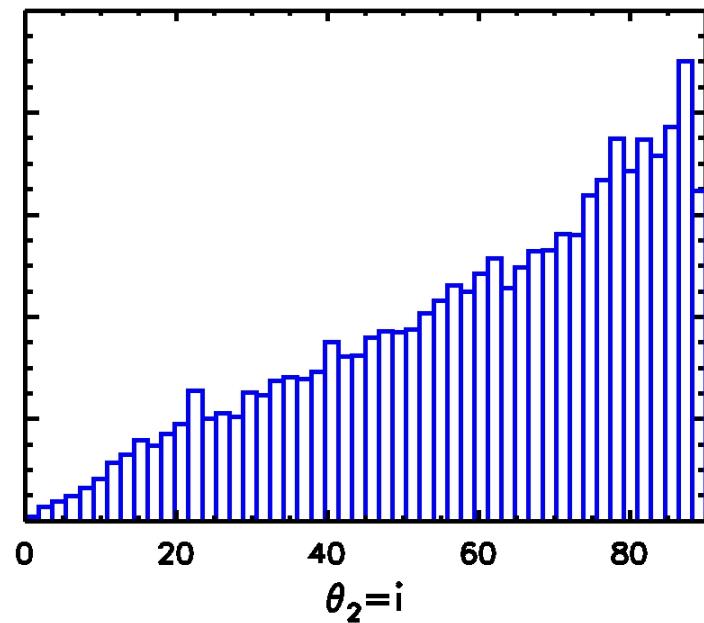
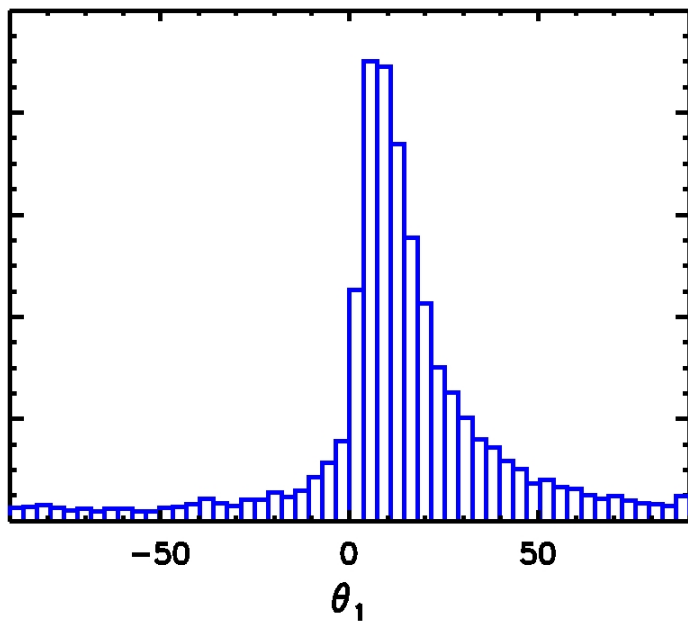
Earth's
Orbit

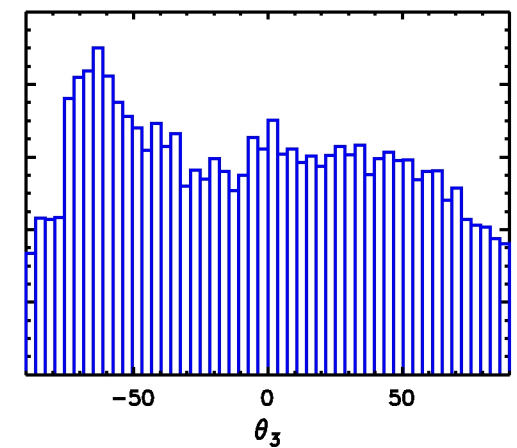
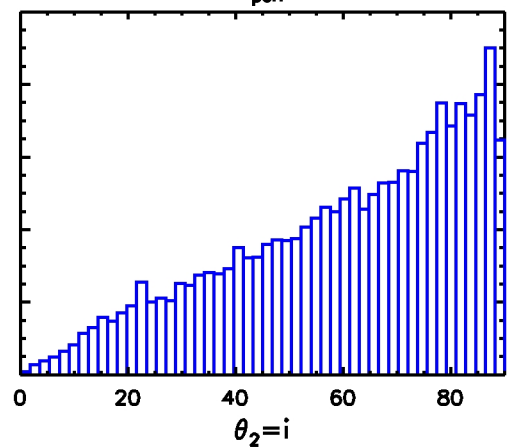
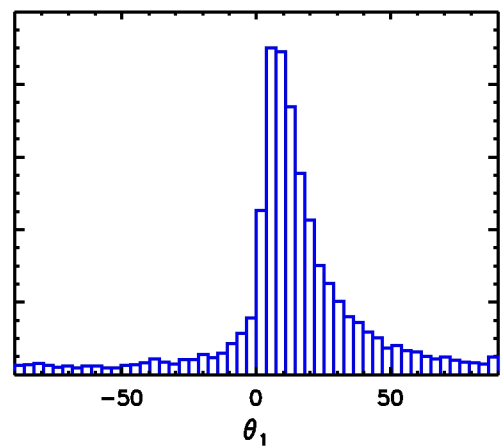
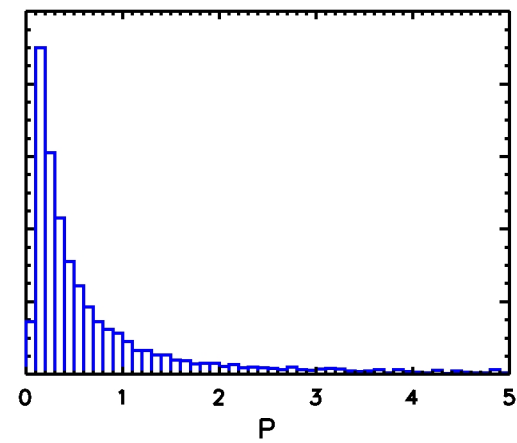
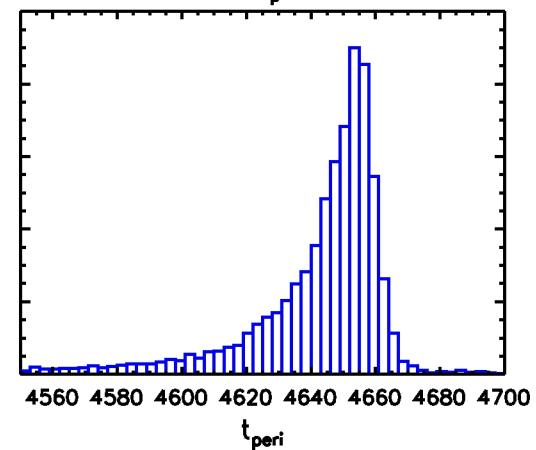
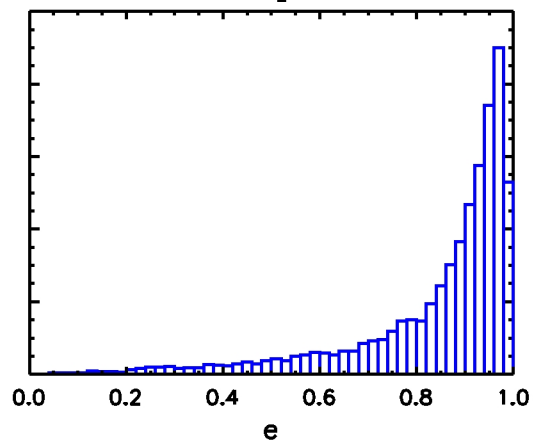
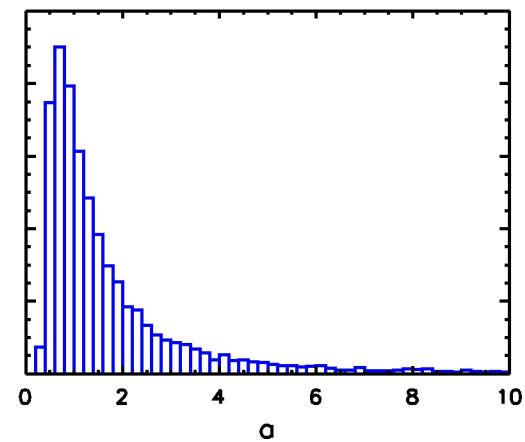
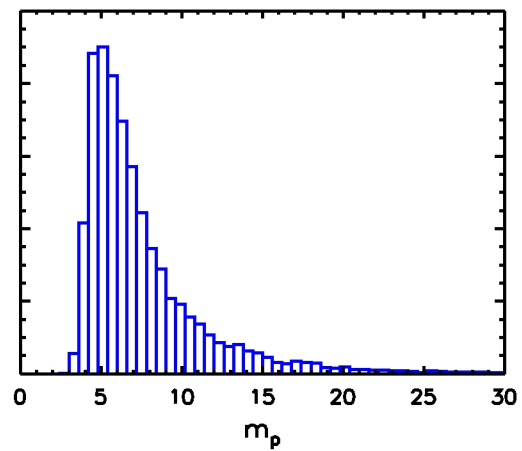
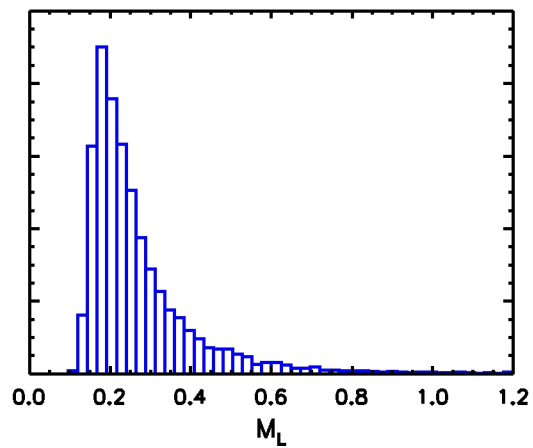
Jupiter's
Orbit

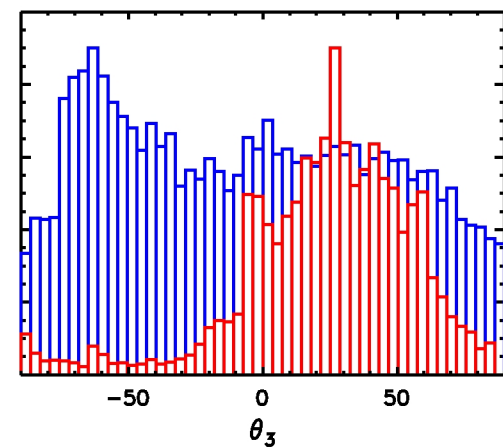
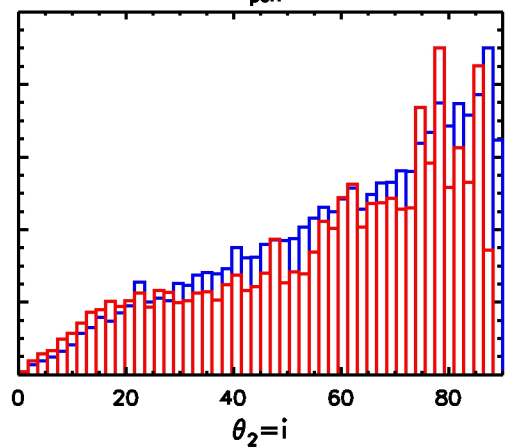
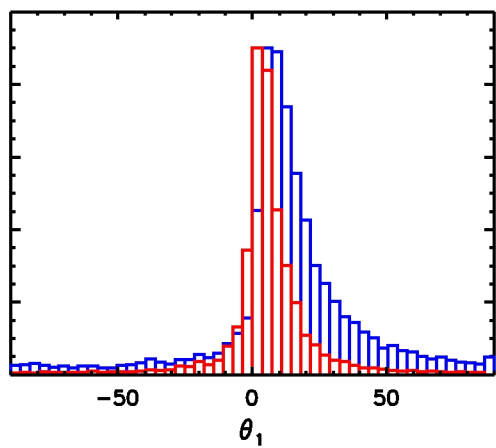
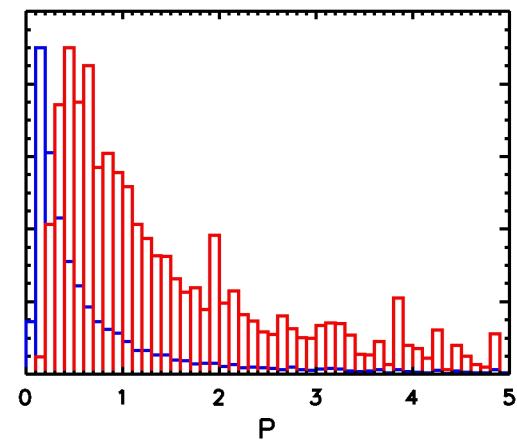
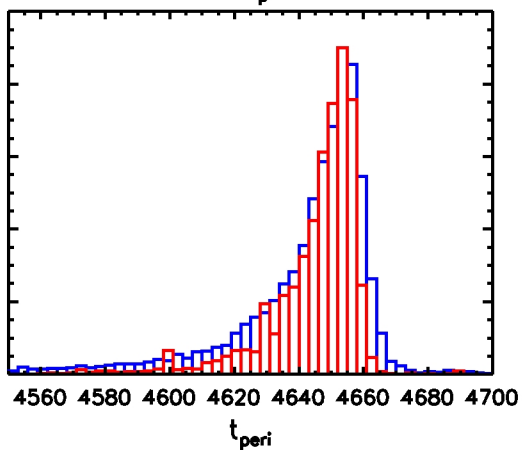
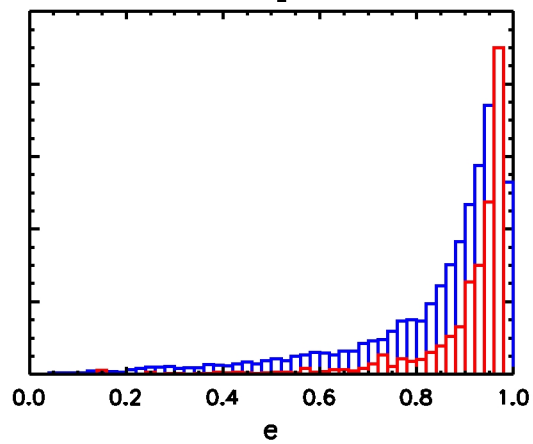
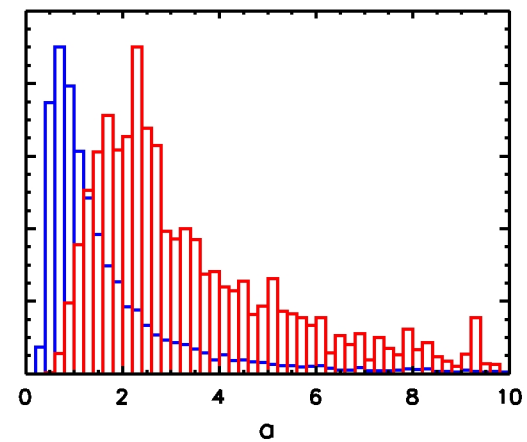
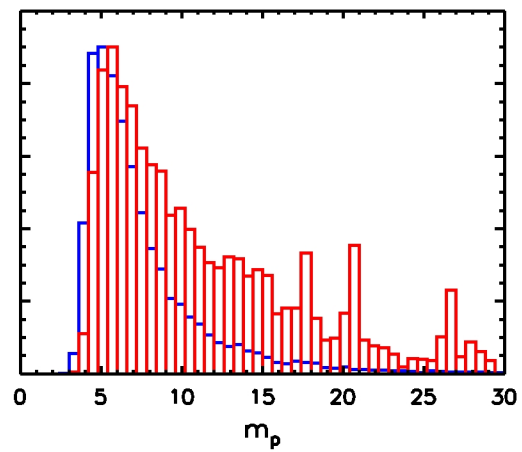
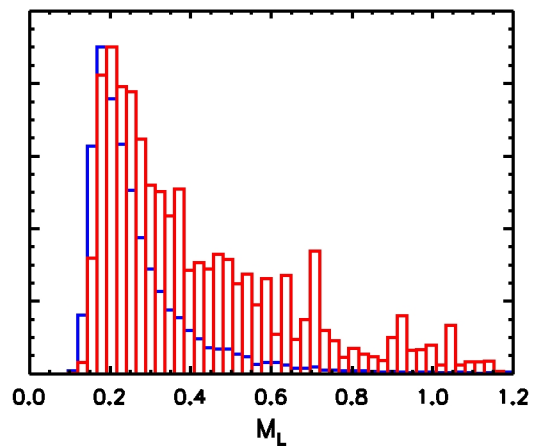
Mercury

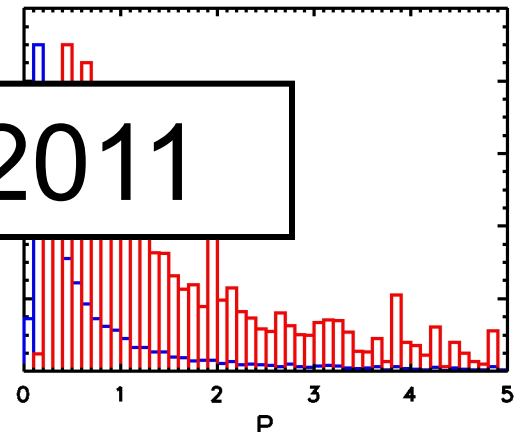
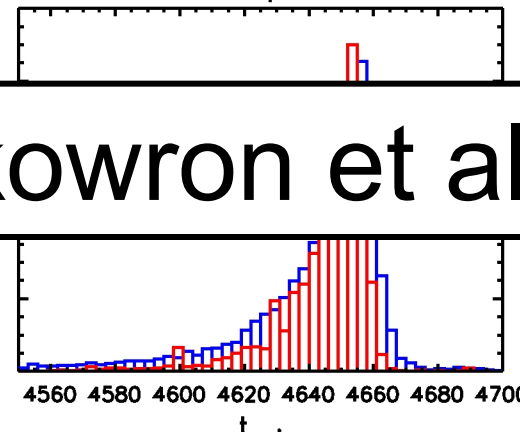
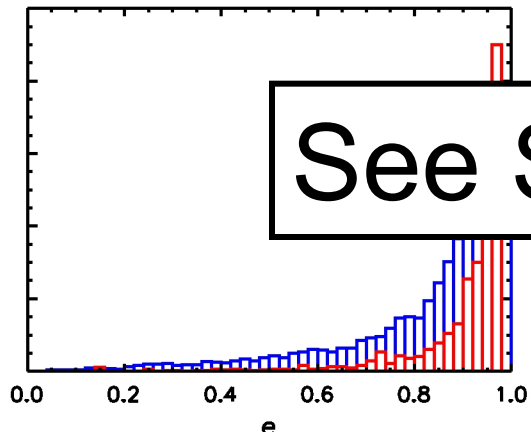
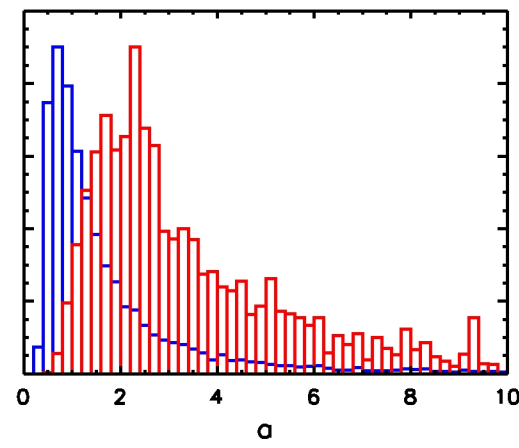
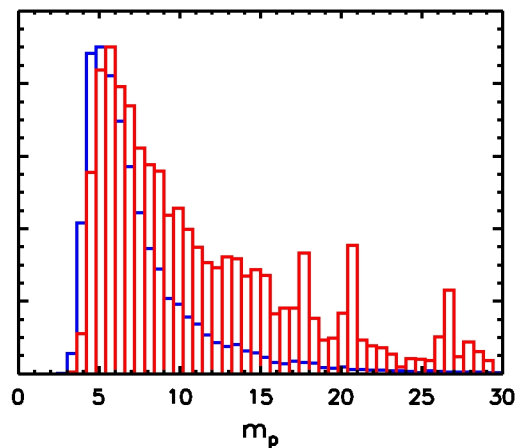
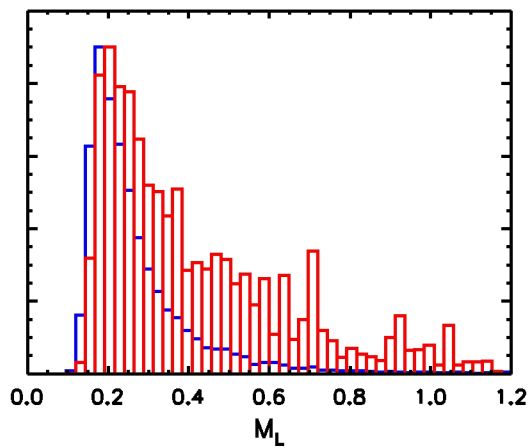
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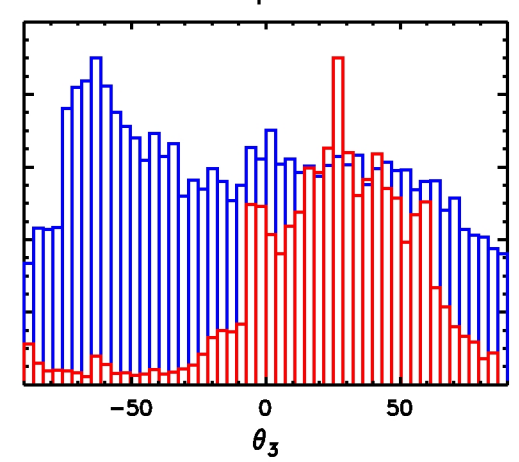
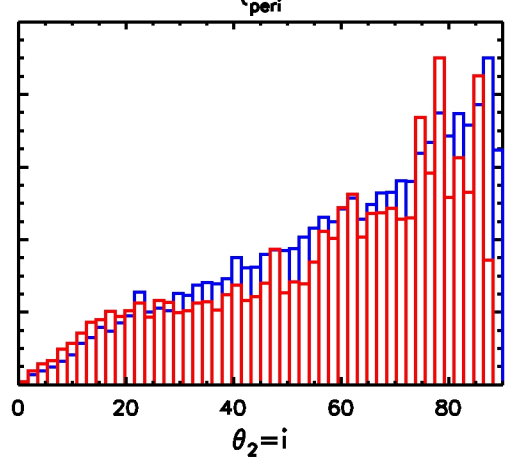
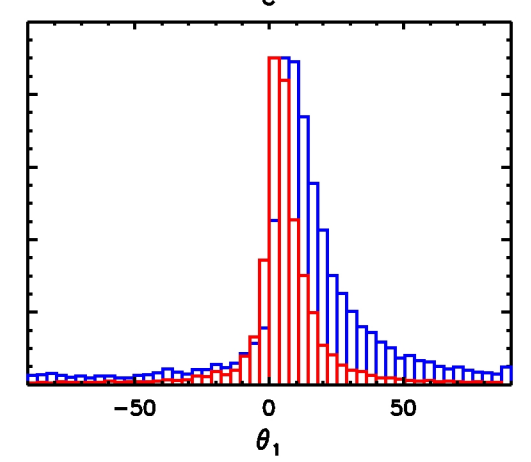


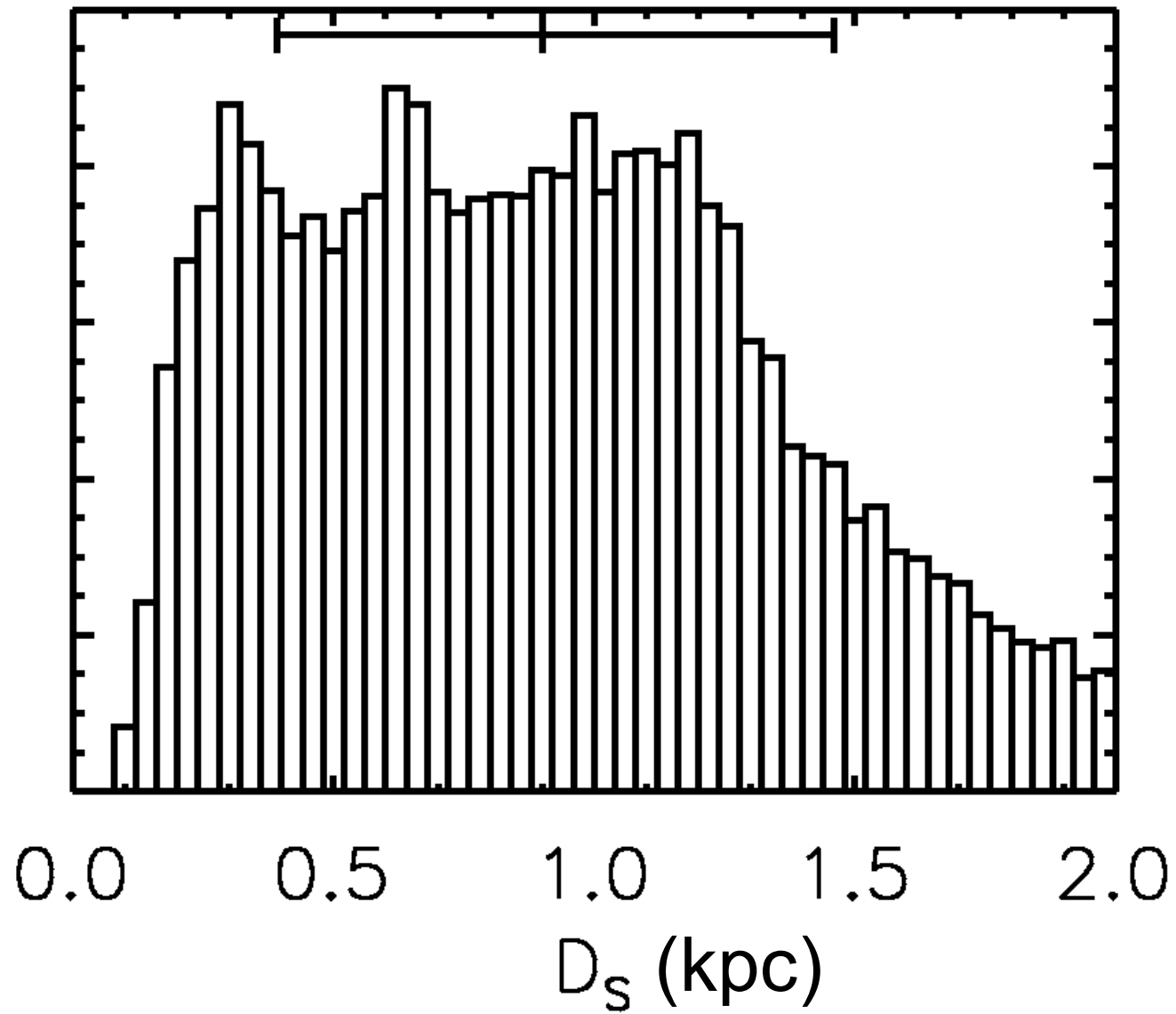






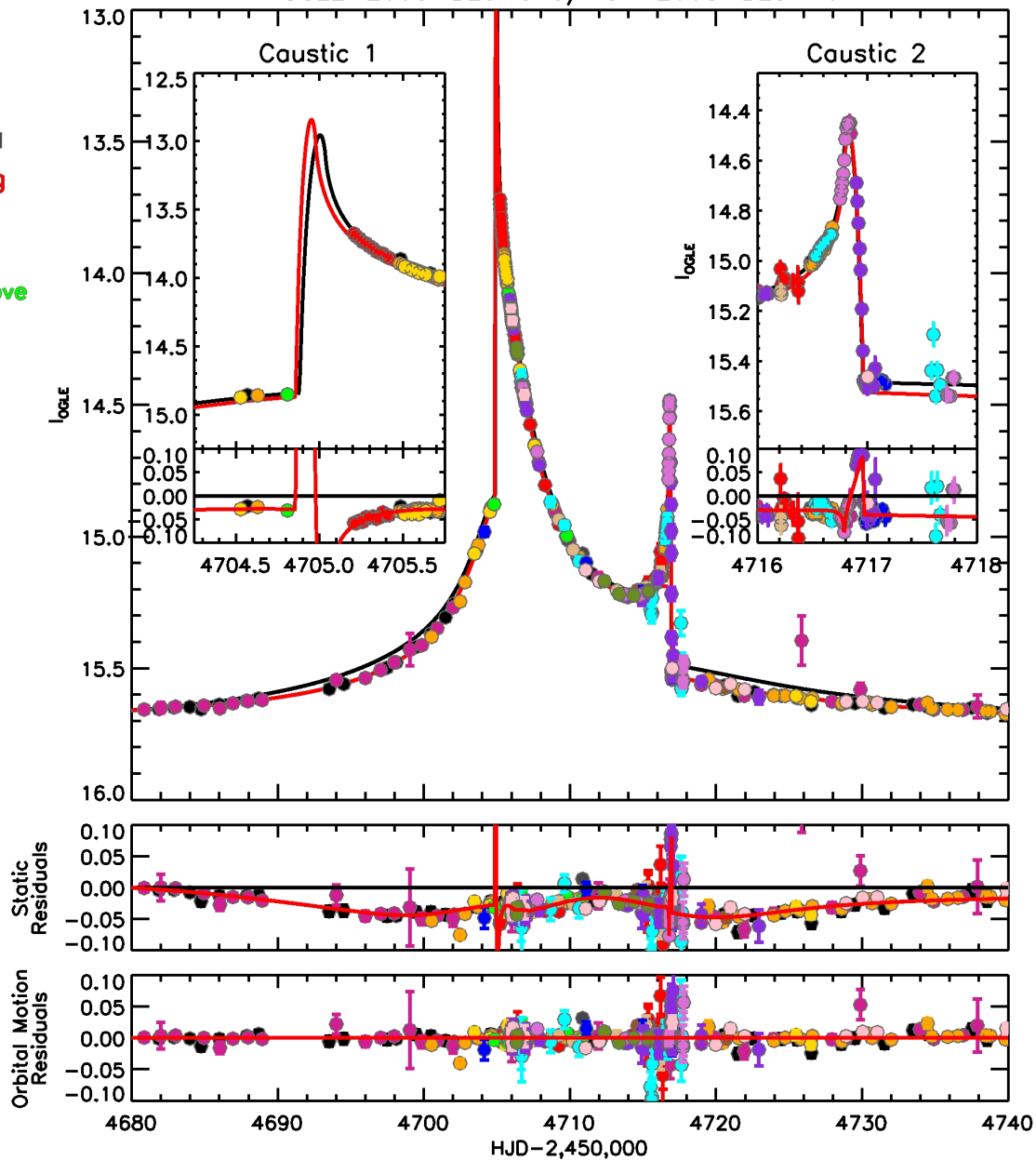
See Skowron et al. 2011





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- OGLE
- MOA
- μ FUN Auckland
- μ FUN Bronberg
- μ FUN CTIO I
- μ FUN CTIO V
- μ FUN Farm Cove
- μ FUN Kumeu
- μ FUN Palomar
- μ FUN Wise
- MINDSTEP
- PLANET Perth
- PLANET Tas
- RoboNet FTN
- RoboNet FTS
- RoboNet LT



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MiNDSTeP

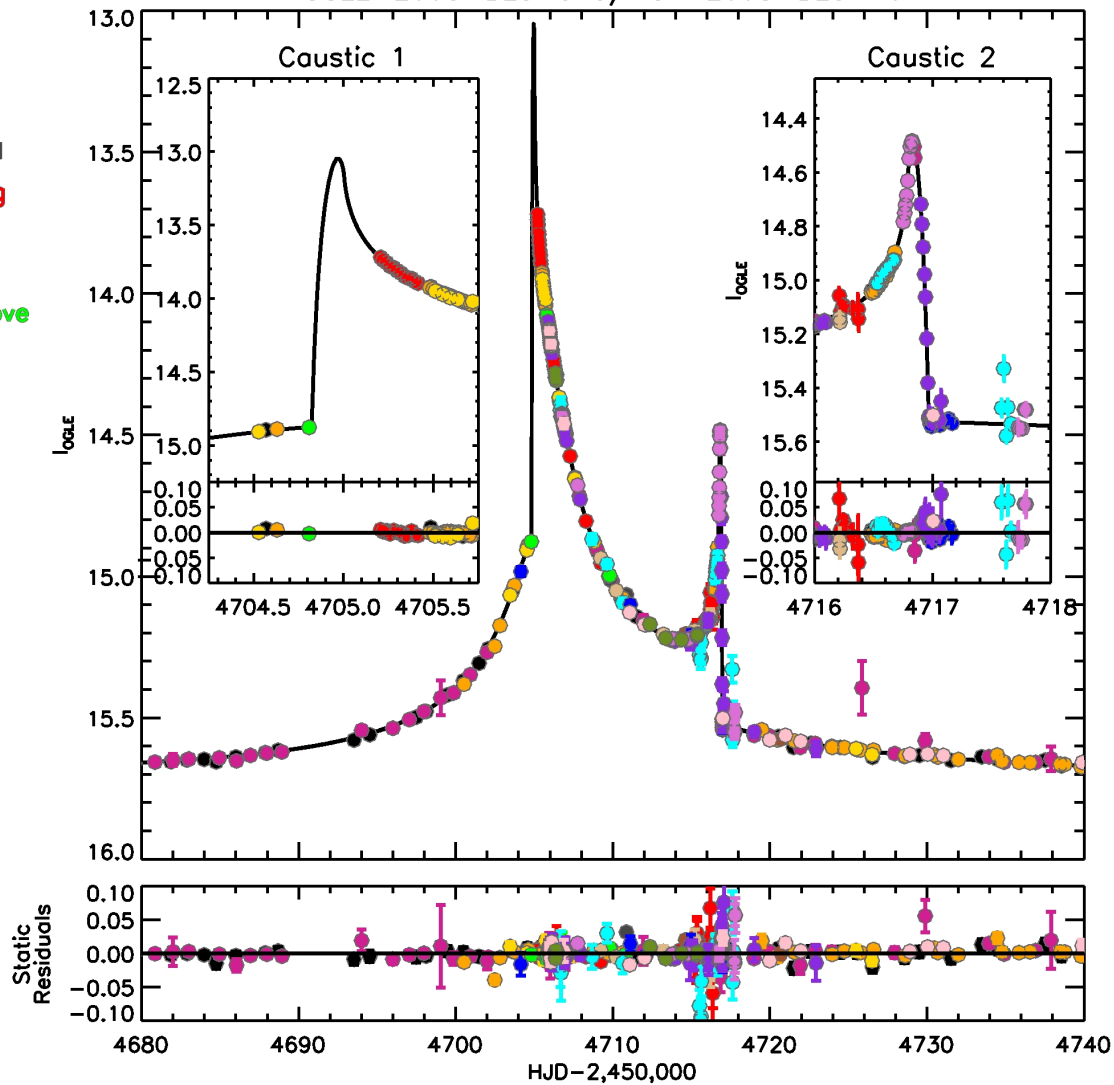
PLANET Perth

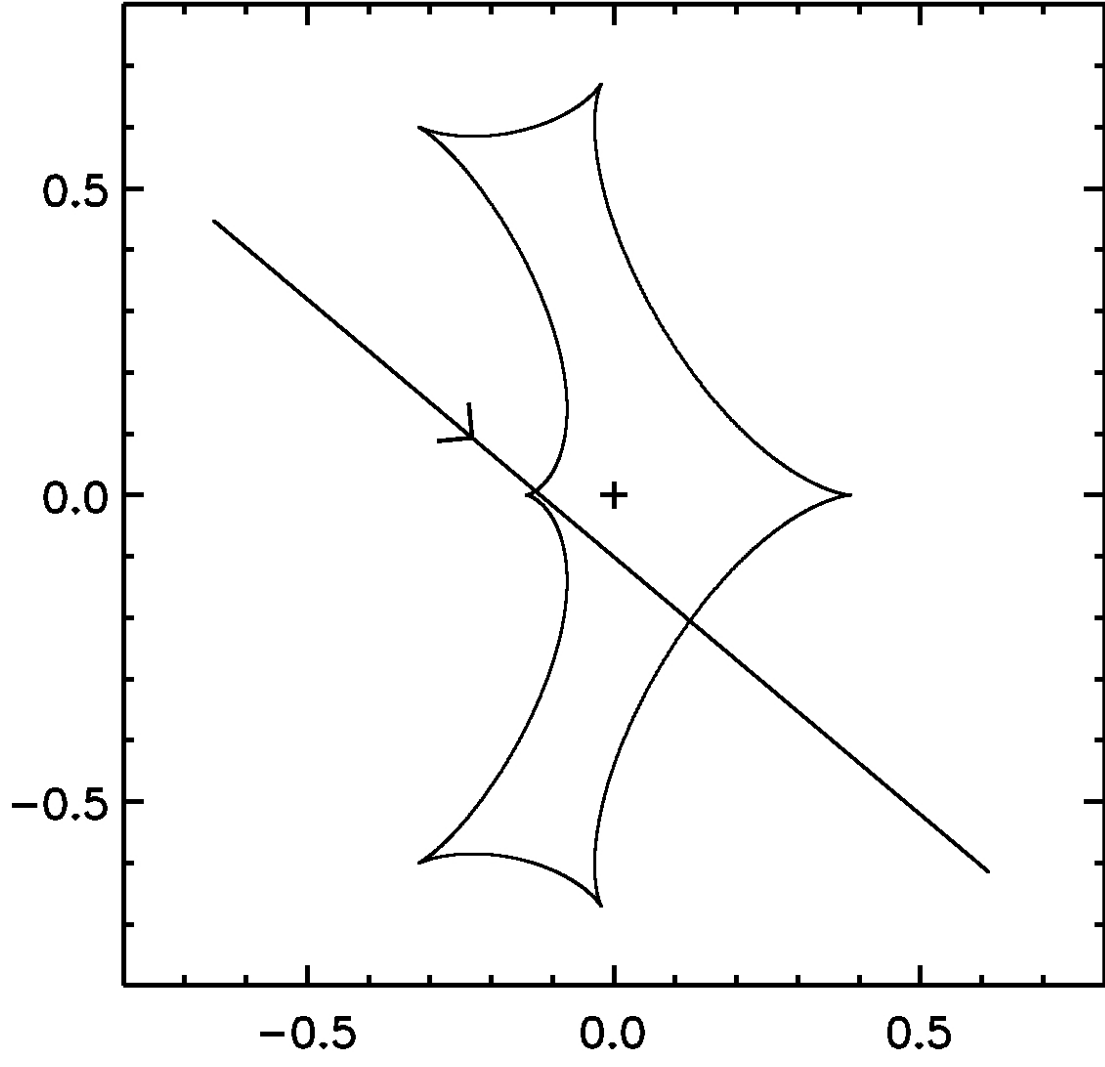
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RoboNet FTN

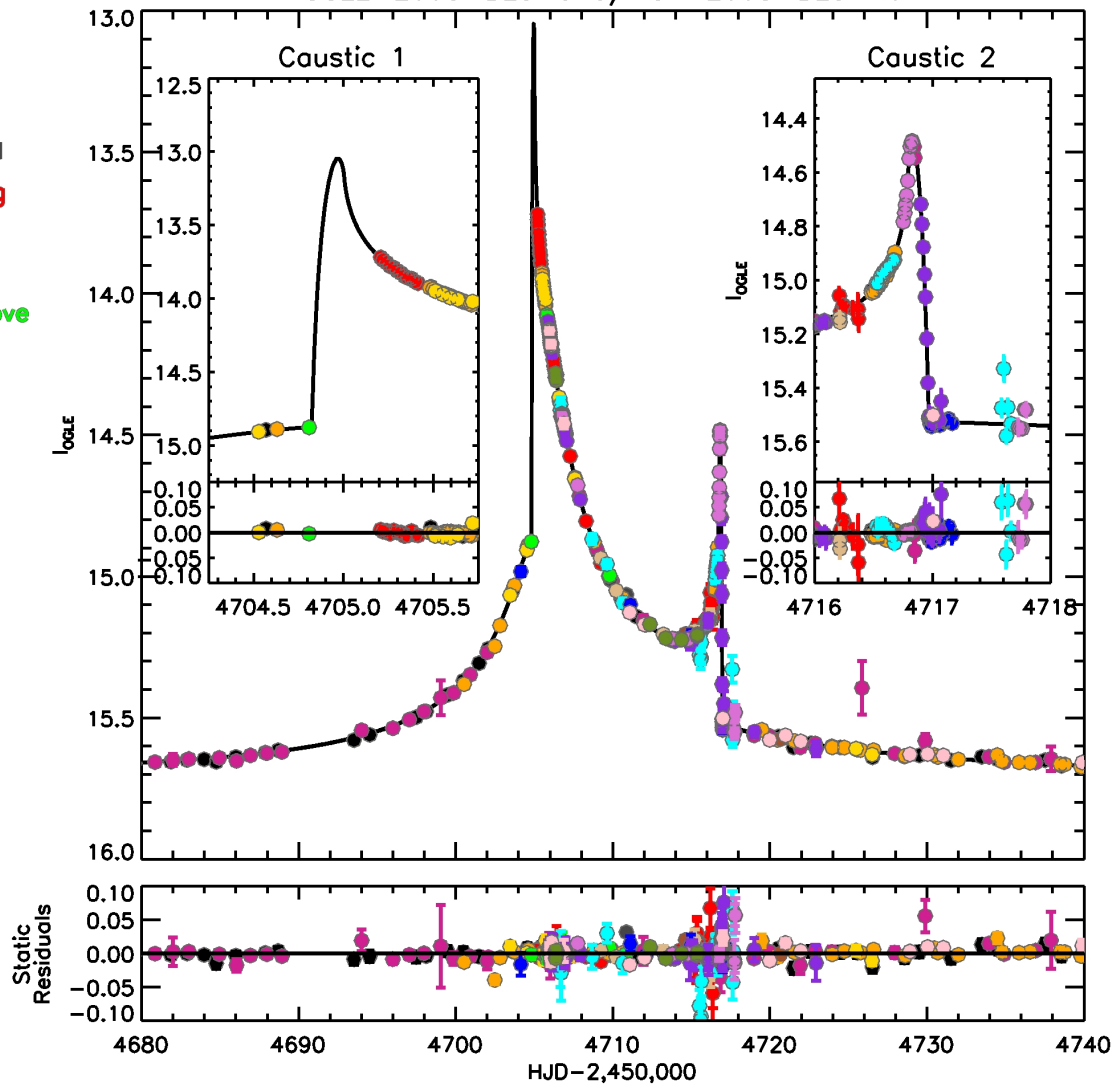
RoboNet FTS

RoboNet LT





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